

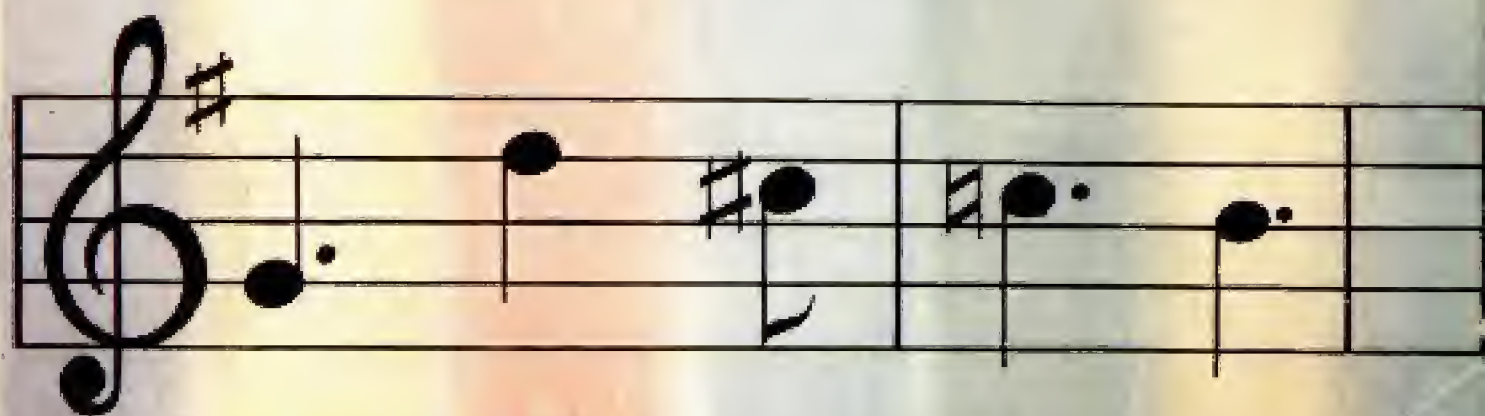
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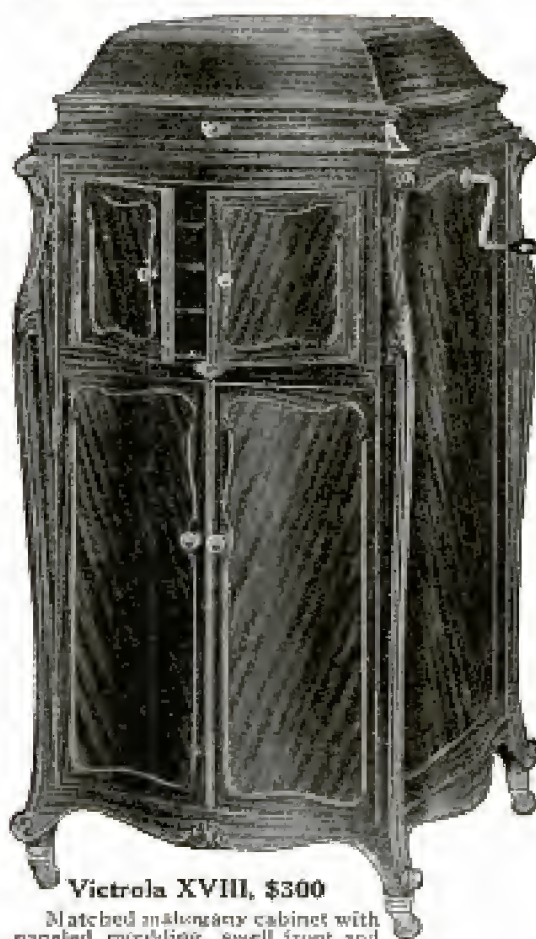
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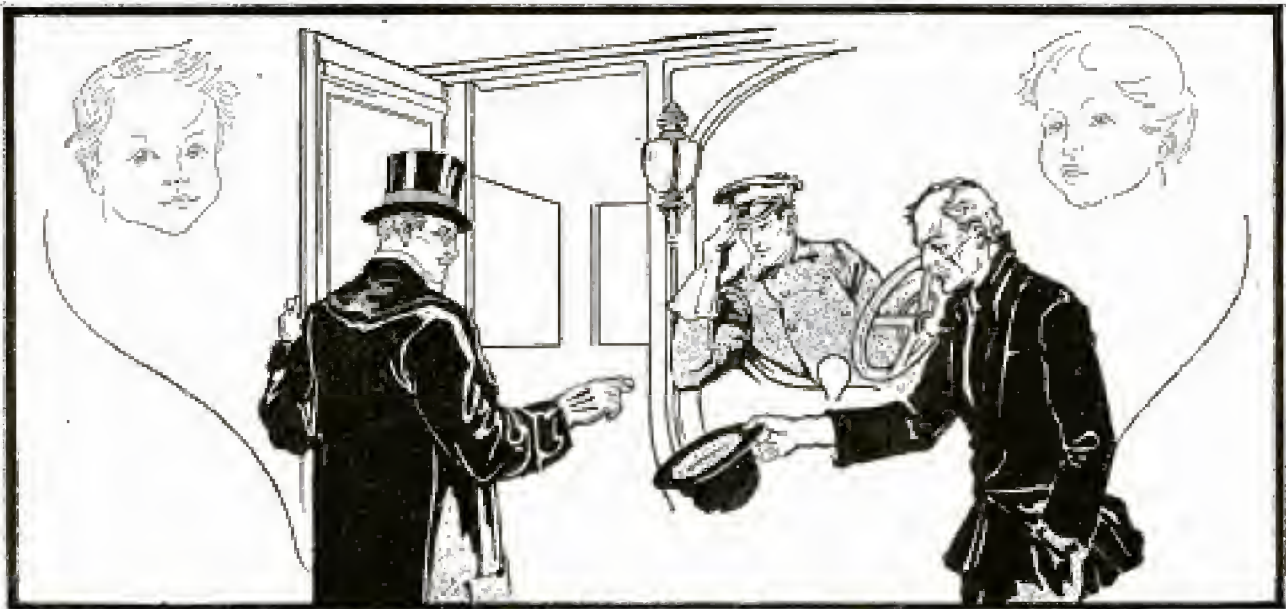
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6. How to establish health by poisoning causes of disease.
7. Scientific eating explained, sample menus.
8. Harmonious combinations of food eaten.
9. How to select, combine and proportion your food according to sex, sample menus.
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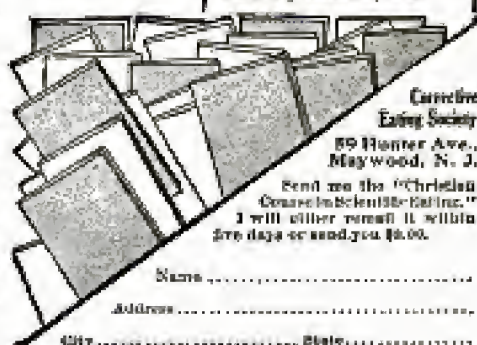
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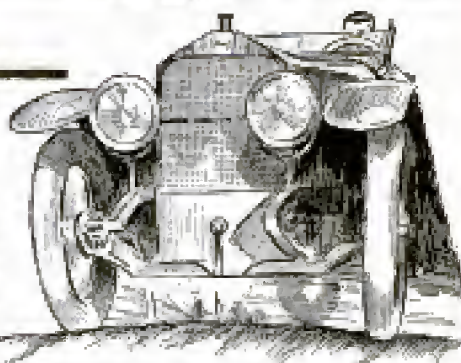
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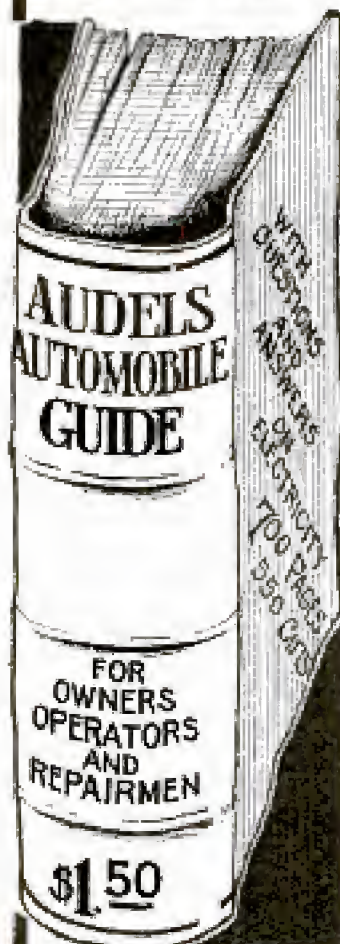
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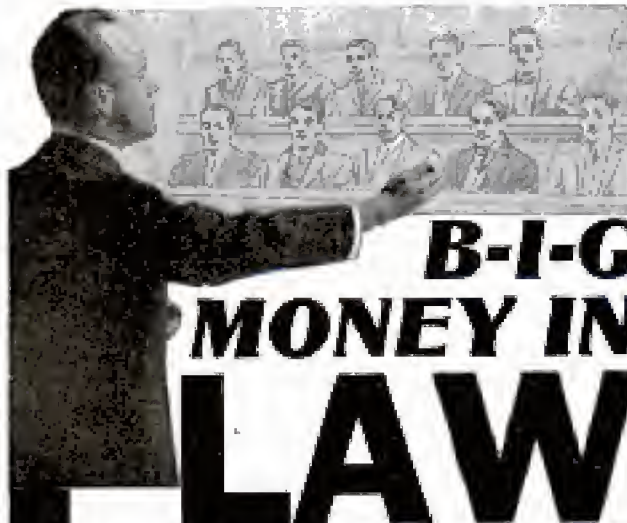
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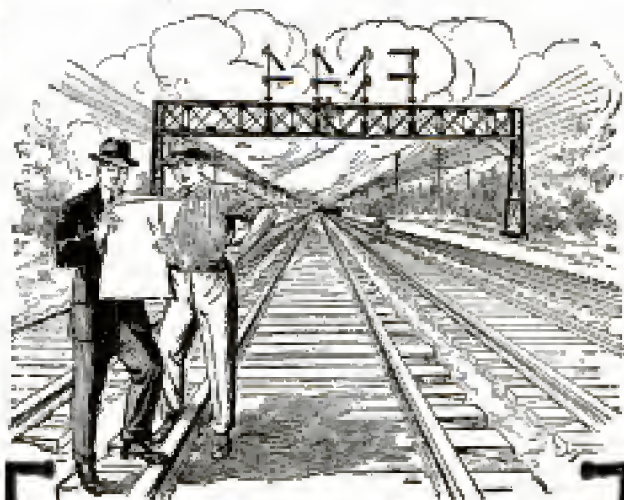
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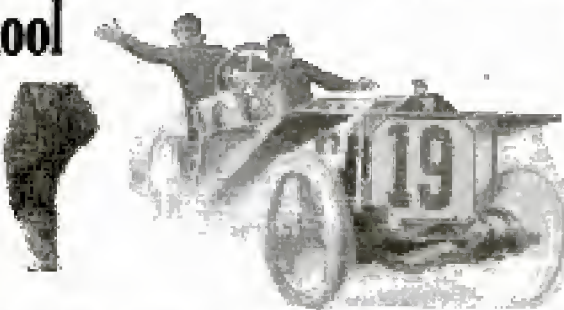
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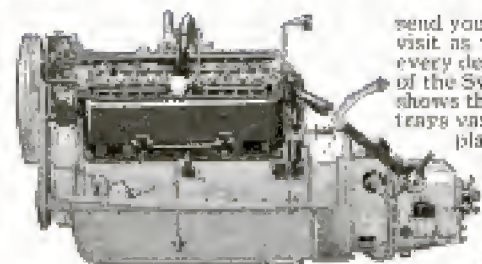
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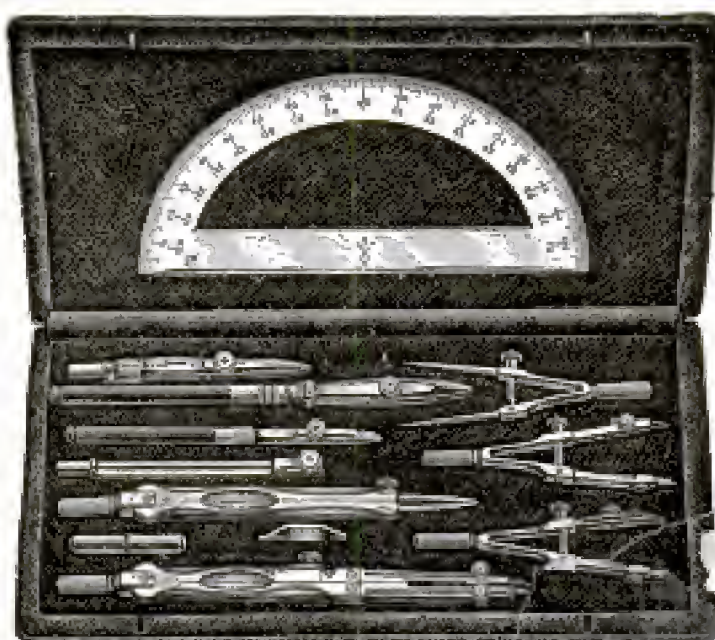
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THE Triple Alliance in Photography for a two-cent stamp. Kapsuze Meters of Merit—the Best Round-Cornered Film Camera Made in America—the Best Arrangement Lenses on Earth. Lathbury Co., 345 North Fifth Ave., Chicago.

EASTLAND Disaster. Real photographs, twelve different, 50c. Money back if not satisfied. Frank Kerr, 3222 Congress, Chicago.

GORDON'S Gauge Meters look film and measure even white negatives. Sizes, 2 1/2x3 1/4, 2 1/2x4 1/4, 2 1/2x5 1/4, 3 1/2x4 1/4, 3 1/2x5 1/4, 4x5 Film-pack. 1x5 Plate. Six for the postpaid. W. A. Gordon, Port Dover, Ontario, Canada.

FRUG Developing. Prints, Postcards, 5c. 8x10 enlargements, 25c each. Superior, Hamilton, Ohio.

FOR Sale—3A Special Kodak. Zeiss-Kodak lens, compound shutter, slightly used, \$50. C. O. D. examination. William Ley, Good Hope, Ill.

FILMS developed, 10c. prints 2c to 5c. A reputable incorporated company, conducting largest existing plant. Price list and special offer. Enlargements our specialty. Chicago Photo Finishing Co., 54 W. Lake St., Dept. A, Chicago.

SECOND-HAND Lenses. All makes and sizes. Work just as well as new ones. Send for our bargain list. Hyatt's Photo Supply House, St. Louis, Mo.

HIGH Grade Amateur Finishing. We cater particularly to those who want good work, not cut prices. Send for price list. H. M. Prince Co., 108 W. 4th St., Cincinnati, Ohio.

HAVE your films retouched and Prints hand-colored. A customer writes our work is 50% better than eight other finishing companies he has sent films to. "We finish your Kodak Pictures better." Let us "show you." Developing 5c. 10x12 Prints 3c. Return 24 hours. Colonial Art Co., Box 366, St. Louis, Mo.

SAMPLE offer: one film roll (only) developed 5c; prints from same 2c each; to show high quality work. Moser & Son, 429 Arcade, Cincinnati, O.

IF you have a High-grade Camera. Lens or Kodak, and want to turn it into cash, write us today. State particulars, price, etc. We buy and trade, sell or exchange. Prompt, satisfactory service. Everything in camera from Vest Pocket to Graflex. A square deal to all. David Stern Co., 104751 W. Madison St., Chicago. In business since 1885.

ROLL Films developed 10c per roll. Printing Post Cards 3c each. 15 years' experience. Give me a trial. You will be pleased. F. C. Hoyt, Sae City, Iowa.

50c TRIAL offer for 10c. Send me roll of film, any size, 8 or 12 exposures (or film pack); we will develop film or pack and make total of 6 pictures from best negatives for 10c (stamps). Beautiful 10-inch mounted enlargements, 25c. Price list and sample print free upon request. Hummel Cycle Company, Rochester, Va.

CAMERA and Lens Bargains. Cut Rate Photo Bargain List just off the press. Send stamp. Willoughby, 810 Broadway, New York.

WE buy, sell and exchange. Bargains in Microscopes, Telescopes, Binoculars, Cameras, etc. Bargain list sent. Kahn & Son, Utica, N. Y., 54 John St., New York. Established 62 years.

FILMS developed 5c. prints 2c. All sizes, Johnson's Studio, Oswego, N. Y.

Big Money Saved in Photographs Lenses and Apparatus—goods exchanged; repairing done. Ralph J. Cohen, 45 East 49th St., Chicago, Department P.

FILMS developed 10c. all sizes. Prints 2 1/2x3 1/4, 3c; 2 1/2x4 1/4, 3 1/2x4 1/4, 3 1/2x5 1/4, 4c; Post Cards, 50c doz. Work guaranteed and returned 24 hours after developing. Postpaid. Send negatives for samples. Girard's Commercial Photo Shop, Holbrook, Mass.

SAVE 40% on Photo Paper from factory, prepaid. "Instanta" has a sparkling quality no other daylight paper possesses. Quick printing develops easy. Money back guarantee. Send 25c for 3 dozen prints or 45 size, price list and full directions. Photo Products Co., Dept. J, 6100 La Salle St., Chicago.

ROLL Film developed, 10c a roll. Prints 25c each; Prints, Broadsides, 2c; 1x2, 3x5, and Post Cards, 3c each. Work returned next day. Postage paid. Kodak Film Finishing Co., 112 Merchants Station, St. Louis.

MOTION PICTURES

FREE Course. "How to Write Photo-plays." to buyers of our list "Buyers of Photo-plays and Stories." Information free. Writers' Publishing Co., 400 Massena Bldg., Columbia, Tenn.

MAKE \$50.00 clear nightly. We start you in the moving-picture business on the installment plan. No experience necessary. Write for free catalog. Monarch Film Service, Dept. P, Memphis, Tenn.

WHITE Moving Picture Plays: constant demand, big prices paid; devote all or spare time; past experiences or literary ability unnecessary. Details free. Glass Co., 210 Whitcomb St., Cincinnati, Ohio.

HOW to Write Photo-plays. A new book. Price 25c. Hyde Co., 34-3443 Levee Ave., Chicago.

DYNAMO specially for movie theatres. Payments \$5 monthly. Robert Frost, Troy, Ohio.

Big money writing Photo-plays; details free to beginners. No correspondence course. Producers League, 230 Wabash, St. Louis.

MAKE big money writing moving picture plays. Previous experience, literary talent or correspondence course unnecessary. Free details and special offer. E-Z Scenario Co., 311 West 53d St., New York.

WHITE Moving-Picture Plays. Good prices. Devote all or spare time. No correspondence school. Details free. Atlas Publishing Co., 204, Cincinnati.

25 PROFIT Nightly—Moving Picture Business—small capital starts you, no experience needed. Teach you—furnish everything. Ralph J. Golsen, 62 E. 46th St., Chicago, Dept. 31.

PHOTO-Plays Wanted. Big prices paid. We show you how. Details free. Rex Publishers, Box 175A, Chicago.

BUSINESS OPPORTUNITIES

MEN—Learn to make my sparkling clipped glass name plates, house numbers, signs, etc.; make \$15 a day; write for my big free 32-page book, 45 fine illustrations, etc.; tells how. E. E. Palmer, Wooster, Ohio.

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20,000 FORMULAS. Recipes, 500p. volume, \$1. 3,000 valuable trade secrets, formulas, 366p. volume, 40c. 1,000 selected formulas, 110p. volume, 25c. All three, \$1.50. Satisfaction guaranteed. Ideal Book Shop, 331-J, Belleplaine Ave., Chicago.

WANT Big Profits? Learn Tartaric Acid for Silking. New process opens enormously profitable business. Particulars free. H. Baskins, 514 Elm Street, Oakland, Calif.

PATENT Investors. Manufacturers, Merchants, read Scientific Method, 410 Fleet Avenue, New York. All libraries. "Market Place of the World for New Inventions." Six months, 25 cents.

OPERATE Mail-Order Book Business. Fastest, best paying line in Mail Order Field; everything furnished; folders, wholesale price lists, free. Bellini, Box 5272, Boston.

WE start you in business, furnishing everything. Men and women, \$50.00 to \$200.00 weekly operating our "New System Specialty Candy Factories;" home or small room anywhere; no canvassing. Opportunity lifetime; booklet free. W. Ragsdale Co., East Orange, N. J.

TWELVE Years Ago I started a small mail-order business at home in spare time with a few dollars capital. I wanted to make \$20 or \$30 a month evenings. The net profits the first year averaged \$200 a week. "Five years" work netted me \$50,000. I will show you how to start a small mail-order business. Send today for my proposition. It's interesting. No canvassing. Hagcock, Box 567, Lockport, N. Y.

MIRROR restoring is a paying trade. We have best instructions, 25c. Auburn Supply Co., 1817 Peoria St., Chicago.

Yr'g Ideas may bring wealth if patented through Credit System. Send sketch. Free search; book free. Waters & Co., 5103 Warner Bldg., Washington, D. C.

CANDY making a profitable and pleasing trade. Be your own employer. Our Candy Book tells how, 25c. Auburn Supply Co., 1817 Peoria St., Chicago.

HEBES Recipe Book and Herb Catalogue, 10c. Teaches how to make medicine from herbs for all diseases. Herb Gardens, Dept. 44, Hammond, Ind.

GET my 100-page book, "1,400 Ways to Get Rich." Money-making discoveries, secrets, formulas, recipes, mechanical secrets and methods. 25c. Robinson, 5 Water St., New York.

YOUR 25-cent advertisement placed in all of 39 good monthly magazines, once for only \$1.25, three months, \$2.50. Write for list. E. L. Miller, Syracuse, N. Y.

RESTORING Mirrors; guaranteed process; 150 formulas, 20c. Ideal Book Shop, 311-J, Belleplaine Ave., Chicago.

"DOLLARS" yearly in your back yard. No growing, mushroom dope. New ideas never before published, particulars free. Metz, M., 223 East 29th St., New York.

OWN a business. Co-operate with me evenings at home. Everything furnished. Don't worry about capital. Boyd H. Brown, Dept. K-K, Omaha, Neb.

BUILD a \$5,000 business in two years. Let us start you in the collection business. No capital needed; big field. We teach secrets of collecting money; refer business to you. Write today for Free Printers and new plan. American Collection Service, 101 State Street, Detroit, Mich.

FORMULAS 10c each. List 5c. Formula Service, 331-J, Belleplaine Ave., Chicago.

"HIDE Yourself as Boss." Big corporations will back you in Money-Making Mail-Order Business selling guaranteed goods. Start spare time. Small capital. No canvassing. Wm. J. Dink, Mgr., Dept. A-19, 20 W. Lake St., Chicago.

INVENTORS: We develop and perfect inventions, make models, dies, tools. Metal stamping and special manufacturing. Garding Bros., Lion Bldg., Cincinnati, O.

START in the Carpet or Clothes Cleaning Business Now. Thorman Vacuum Process unparalleled for commercial cleaning. We show you how. Easily learned. Only \$125 capital needed to start good income in towns of 2,000 and over. Write today. Thorman Vacuum Cleaner Co., manufacturers all types Vacuum Cleaners. Dept. H, St. Louis, U. S. A.

START a business of your own. Manufacture our Sanitary Paint. Water-sun-dry-proof, will not rub or peel off. Better than oil paint. Costs about 25c a gallon to make, any color. Petrolage and copy-righted process of making, \$2.00. Sample 25c. Sanitary Paint Co., 1873 East Main Street, Columbus, Ohio.

YOUNG Man, be a sanitary cleaning contractor. New business; repeat. Every home a prospective customer. Housekeepers enthusiastic. Sample mailed for 7c stamp. Instructions free. The Crown Sanitary Laboratory, Hamilton, Mo.

START Mail Order Book Business. Particulars free. Golden Specialty Co., 18257, Greenleaf, Chicago.

SELL our Goods by Mail. Earn \$5 to \$50 weekly. A few hours' pleasant work daily, and \$5 capital starts as clean a mail-order business as you can put your name to. Details free. "Expert." 420 Home Bank, Baltimore, Md.

\$10,000 JOB open. Can be filled by inventor, mechanic, laborer, farmer, clerk, advertising writer, or in fact any intelligent person either sex having slight inventive or imaginative ability. Will not interfere with other employment or take party away from home. For particulars address Patent News, Dept. 111, Washington, D. C.

SAN-G-FEX, sanitary, fireproof floors for kitchens, pantries, dentures, hospitals, etc. Learn how to mix and spread and have an income of \$150 to \$300 monthly from kitchen floors alone. Instructions \$3. San-g-fex Company, Mechanic Street, Washington, Indiana.

I PUBLISH a Wonderful Magazine of money-making plans, ideas, suggestions and inspiration! It will show you how to make more money. Sample, 30c. Editor Hooper Magazine, 450 Northwestern Bldg., Chicago.

INVENTIONS commercialized on cash and royalty basis. Inventors, manufacturers and agents write: Adam Fisher Mfg. Co., 61 Fisher Bldg., St. Louis, Mo.

PHOTO-Plays Wanted. Big prices paid. We show you how. Details free. Rex Publishers, Box 1750, Chicago.

MAKE Big Money Opening Sales and Selling Combinations. Wayne Steing, Box 1439, Los Angeles, Cal.

MEN and women for easy business. No interference with present position. Good money. Free information. F. Leonard Eager, Waterbury, Conn.

NEW Way to Paint Signs—Our patterns do the work. Complete alphabet etc. Buha Advertising Co., 15 W. 14th St., Kansas City, Mo.

WOULD you like to own a good-paying Mail-Order Business? We have a line that gets repeat orders all the time. You can start in spare time; invest a dollar or two a week and soon own a nice business of your own. Particulars free. Nadieu, 4313 Lincoln Ave., Chicago.

INDEPENDENCE and fortune quickly attained in the Manufacturing Mail Order business. I furnish Formulas, Manufacturing Processes and Trade Secrets in all lines. Sold under positive guarantee; 18 years' practical experience. Herndon and improvement of Formulas and Processes—reduction of manufacturing cost—utilization of waste materials, etc., a specialty. Booklet, Formula List, and Valuable Information Free. W. L. Cummings, Ph. D., 187 Standard St., Syracuse, N. Y.

PATENTABLE ideas wanted—Send for 3 free books. H. R. Owen, 38 Owen Bldg., Washington, D. C.

WHITE Moving-Picture Plays. Good plots. Devote all or spare time. No correspondence school. Details free. Atlas Publishing Co., 3044, Cincinnati.

ADVERTISERS, Mail Dealers: Our 1000 Rate Book lists 2,000 Principal Publications, rates, circulation. Includes 20 Mail-Order Plans. Price 10c. Herndon Advertising Agency, 230 Franklin Bldg., Chicago.

LEARN the Real Estate Business. Our complete instruction book teaches: Listing, Appraising, Management, Salesmanship, Insurance, Brokerage, Advertising, Renting Agency, Forms, etc. 121 subjects. Extra \$20.00 correspondence course. Rushes cover, 75c. Silk cloth \$1.00 postpaid. Realty Book Company, 5982 Euclid Ave., Cleveland, Ohio.

LET the parents post help you. Add \$15 to \$25 weekly to your present salary or income. Start during spare time and build up a permanent mail-order business of your own. We show you how and help you make good. No canvassing. Experience unnecessary. The Parents Post makes success doubly sure. Our new ideas and up-to-date plans bring the money. No so-called "Course of Instruction" to sell. We give that free. Write today. Address Parents Post Co., Inc., Dept. A, 70 Broadway, Buffalo, N. Y.

HOW to Operate a Mail Order Business. 30 Big Profit Plans and year's Mailing service sent for 10c. Mail Dealers' Wholesale House, 521 Franklin Bldg., Chicago.

BE Wise. Don't experiment in mail order. I can tell you how to succeed. H. Newnam, Waukegan, Ill.

MANUFACTURERS, Promoters and Patent Buyers are invited to write us stating the line of invention in which they are interested, as we can supply their wants in any class of patents. Victor J. Kraus & Co., 162 Ninth St., Washington, D. C.

LEARN to collect money. Good business; quick results. Send for free booklet, "Skillful Collecting." Collectors' Association, Long Street, Newark, Ohio.

STOP Here! Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhies, Desk C. R., Omaha, Neb.

I WANT to send you proof of the wonderful selling power of Popular Mechanics classified pages. What's your proposition? Write me today. F. W. Johnson, Classified Dept., Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

DUPLICATORS AND DEVICES

"TIFFY" Duplicator. \$3.00. Prints 1,000 postcards, etc. 50% to agents. E. N. Fales, Chicago.

MALABIANE Duplicators excel all, 16x12 size. \$2.50. Sent on 2 months' trial. Ask booklet. Malabian, 1265 Southern Boulevard, New York.

THE B. & B. Duplicator will print 150 copies in ten minutes, pen, pencil or typewritten original. Later size, \$1.75. Booklet free. Brody & Batzenberg Duplicator Co., Desk P, 1126 S. Halsted St., Chicago, Ill.

MULTIGRAPHES (rebatte). Perfect. 1/8 cost. Guaranteed. Ship on approval. John Paul, Bourne Bldg., Philadelphia, Pa.

OUR "Modern" Duplicator—Yours for \$2.49. No glue or Gola. Always ready. All sizes. Free trial. \$1,000 users. Standard for 15 years. Booklet free. Sole mfrs., J. E. Purkin & Reeves Co., 339 Fifth Ave., Pittsburgh, Pa.

TO MANUFACTURERS

WANTED—Summers in manufacturing advertising service on royalty. T. J. Dalton, Houston, Texas.

WANTED—Side line suitable for our Novelty Altar. Novelty Altar Mfg. Co., Stamford, Conn.

WANTED—Manufacturing company to make our Electric Razor. Must be well equipped and furnish all machinery. John Morris, Carson, Iowa.

FOR ADVERTISERS

YOUR advertisements placed in 35 different magazines for 3c per word; displayed, \$1.80 per inch; three times for price of two. List, particulars free. King's Magazine, Box 11-P, Little Silver, N. J.

BARBAIN—20-word ad, one insertion, 35,000 circulation and one year subscription 25c; extra words, 1c. Digest, Grand Rapids, Mich.

PERSONAL

FREE—Stop using Tobacco. Free. We will give free information how to conquer the habit easily and permanently. Results Guaranteed. Anti-Tobacco League, 613 Paxton Block, Omaha, Neb.

BROTHER—Accidentally discovered root cause tobacco habit. Gladly send particulars. F. Stokes, Moline, Florida.

AGENTS WANTED

AGENTS Wanted—If you know a chance when you see it you'll see this one now. Big money—stylish, nifty clothes—little work—no experience or capital needed—can you beat that? We want agents everywhere to take care of our business in their localities and to advertise our nifty, nifty suits by wearing them. We furnish everything, complete, and charge nothing for agent's outfit. The swiftest dressers everywhere are our agents, and all we ask is that you tell people who inquire about your fine clothes where and how they can get them. You make big money—\$10 a day—without trouble. Just a postal brings you full outfit free. Big, new sample book of up-to-the-minute suitings sent so you can pick out your best suit; also measuring blanks and everything you need. We pay express on everything—not a penny for you to pay. Send quick before some one else gets the agency there—mail postal today to the American Woollen Mills Co., Dept. 911, Chicago, Ill.

MEN and Women Agents: Money talks—how much are you making? If you are earning less than \$200 a month, in matter what your locality, you will positively be delighted with our Sentinel Burglar Alarm proposition. Many agents easily earn \$15.00 daily. Brand new invention. Sells quickly on sign to homes, offices. Patented. No competition. Free exclusive territory. Instantly attached any door knob. Impossible turn knob without ringing bell. No batteries, screws, nails. Handicrafty nickel-plated. Retail \$1.00. Provides cheap burglar insurance. It's a big money maker. Let us prove why. If you mean business write today for liberal terms to agents. Marshall Robbins & Co., Manufacturers, 1427 Marquette Bldg., Chicago.

INEXPERIENCED schoolboy makes \$5.50 first hour. Agents amazed, enormous profits. Marvellous invention. Silver cleaned electrically. Sanitary, simple, convenient. Wiring unnecessary. Women will over it. No drudgery, chemistry's mighty forces do the work. Saves silver, time, labor. Patented, guaranteed absolutely harmless. Chemicals, silveramides, domestic scientists condemn it. Excellent side-line proposition for salesmen. Splendid opportunity for general agents. Particulars, overwhelming proof, all free. Investigate immediately. Conklin Company, Huntington, New York.

WRITE quick. New, big paying territory just open. Take orders for guaranteed Planto Silk Hosiery and made-to-measure underwear. No capital or experience necessary. We teach you free. We pay all expenses. Big money and permanent business for men and women who write at once. Malloch Knitting Mills, Dept. 1180, Grand Rapids, Mich.

100% PROFIT handling polishing cloths for silverware, brass, pianos, furniture, etc. Globe Chemical Co., 220 South New Jersey, Indianapolis, Ind.

WE want agents in the small towns and surrounding territories to introduce our gasoline lamps and mantles. Big money for the man who can sell. For catalogue and full particulars, address: Grand Rapids Novelty Co., 538 Woodward St., Grand Rapids, Mich.

AGENTS are earning money selling our big 10c Packages of 10 Assorted Postal Cards. "5,000 Varieties." "Big Profits." Sell everywhere at sight. Sample Packages 10c. Particulars Free. Sullivan Card Co., 1334 Van Buren St., Chicago, Ill.

FIFTY Dollars weekly, every week, selling our absolute household necessity. Good wide-awake men become permanent house-servants. You can't afford to miss this exceptional opportunity. Commercial Opportunities Co., P. J. Permanent Title Bldg., Akron, Ohio.

AGENTS—Do you want something that sells rapidly, guarantees satisfaction and leaves a liberal profit for you? Sell our Oxy-Acetylene Welding and Cutting Outfits to garages, repair shops, etc. Big field. Write for literature proposition. American Welding Co., 3721 Michigan Ave., Chicago.

DON'T be an Agent—You take the money; be your own master. Dams Crawford, W. Va., writes: "Made \$42.75 first week." Smith, Pa., writes: "801 in two weeks." Postelick, N. Y., writes: "Make an average of \$10 a day." We have started hundreds of others. Gray's outfits, \$15 and up. Plate Gold, Silver, Nickel, Metal, etc. We furnish needles, formulas, trade secrets and teach you the art; work easy. Royal new dipping process. Every family, hotel, restaurant, shop has tableware, jewelry, metal goods of all kinds to be replated. Every other business overcrowded, few plating shops. Send postal, free sample plating. Gray & Co., Plating Works, 731 Gray Bldg., Cincinnati, O.

AGENTS to handle our Novelty Altar; a religious article; sells on sight to Catholics. Inquire proposition. Novelty Altar Mfg. Co., Stamford, Conn.

AGENTS—Sells itself—millions will be sold—household necessity with premium—big profit—write quick. Black, 189 Woodward Ave., Buffalo, N. Y.

AGENTS—Write for particulars of best selling 100% household article; show goods, make sale. Summer Specialty Co., A-5410 Augusta St., Chicago.

200% PROFIT. You can't beat it. Sells everywhere. Free pocket sample. Our goods get the orders. Wm. J. Dick, Mgr., Dept. A-4, 20 W. Lake St., Chicago.

WONDERFUL 23c Kitchen Invention; saves labor and money; demonstration creates sensation. \$60,000 sold in Chicago. 200% profit; new sales plan eliminates canvassing. Triumph Manufacturers, Transportation Bldg., Chicago.

100 Textile Mills will employ everywhere reliable people to take orders for dress fabrics, hosiery, underwear, sweaters, waists and skirts from samples. Factory prices. Spare or all time. No experience. Permanent. Many making over \$30.00 weekly. Strandless Mills, 20 Ransom St., Cohoes, N. Y.

SALESMEN for high-grade specialties. Demonstration invariably results in sale. Send for free descriptive booklet and terms. The Mountain Mfg. Co., Upper Montclair, N. J.

AGENTS Wanted—Agents make 500 per cent profit selling "Novelty Sign Cards." Merchants buy 10 to 100 on sight. 500 varieties. Catalogue free. Sullivan Co., 1234 Van Buren St., Chicago, Ill.

AGENTS—Here is your opportunity to get a rapid selling line of real, indispensable, labor-saving tools that has no equal. Every mechanic, autoist, garage, factory, shop, farmer or tool-user needs them. No competition. Big profits. Get our agents' proposition. Imperial Tool Co., Bloomington, Ill.

WANTED—Responsible man in each locality for exclusive agency on Double Service Tires, guaranteed 7,000 miles. Tremendous demand; splendid money-making proposition for hustlers. Write for details today. Double Service Tire & Rubber Co., Dept. B-10, Akron, Ohio.

GUARANTEED quality, unique construction, quick-selling possibilities, agent's easy payment plan, are the distinctive features of RH Multiple-head Filters. Particulars free. Currier-Kosch Mfg. Co., 201 West Ave., Cedaraport, Pa.

AGENTS Wanted—Right here is the one big chance of your life. If you want to make good money—\$10 a day or more, as easy as rolling off a log, and get your well-known free business, you can do it by acting as our agent. We are the biggest people in the business and want our agents to make big money and be happy, stylish dressers. Send a postal today for free \$10 outfit, including a big book of nobly-suiting samples to select your agent's suit from. Then take orders from people who admire your dandy clothes. They come to you—not you to them. This is the way to get rich—the sure, easy way. Remember, you need no money—everything is furnished by us free. We pay express on everything. Just send a postal, but do it today. You can't get started too quick, making this big money and wearing these stylish clothes. Address card to Paramount Tailoring Co., Dept. 244, Chicago, Ill.

PHOTO Follow Tops, Portraits, Frames, Photo Pictures, Photo Plates, Postcards, Reprints credited, Prompt Shipments, samples and catalogue free to agents, 30 days' credit. Jas. C. Miller Co., Dept. R-3, Chicago.

NEW \$2.50 pocket adder, Sell 10 daily easy. Excellent profit. Everyman buys. No competition. J. Bassett, 5521 Indiana Ave., Chicago.

\$150 PER month and expenses—Salary or Commission—Introducing our King Butter Separator. Produces best grade of butter from cream or milk, sweet or sour, in less than 5 minutes. Retail \$5 up. Write for free sample and salary proposition. De King Mfg. Co., Dept. 1231, Chicago, Ill.

GUN Sanitary Wire Frame Brushes and Cleaning Specialties are sold only by Chicago agents. Household necessities. Good territory still open for state agents. Cleaned Brush Company, 71 Taylor St., Springfield, Mass.

SIGN Letter Agents and Painters: 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 404 N. Clark St., Chicago.

AGENTS—Fastest working metal polish known. 30¢ material makes gallon polish. Formula 50¢. Box 713, Maquoketa, Iowa.

THREE Experts roll money. Send name for particulars. Pitts, Wilmette, Ill.

MAKE and sell your own goods. Formulas by expert chemists. Manufacturing processes and trade secrets. Formula Catalogue for stamp. B. Mysic Company, Washington, D. C.

"DECALCO" window letters, newest invention, enormous profits. Samples free. Wadham's, 29 Broadway, Brooklyn.

AGENTS—Boys and girls, to sell our new novelty, Hi-Lo Adjustable Suits. Children delighted on sight. See every eleven pair sold, one pair given absolutely free. Write us. Hi-Lo Manufacturing Co., Sterling, Ill.

HOSIERY, \$1.00 a box; men's and ladies'; agents write quick for exclusive territory. Big Four Hosiery Mills, Reading, Pennsylvania, Dept. M.

ENDLESS Neckties—Something new, ladies like in one; costs no more than old style; man made \$70 three days; woman made \$22 week; write for special agent's offer. Endless Necktie Mfg. Co., Dept. 10, Kansas City, Mo.

AGENTS—\$5 daily selling our Handy Tool, 12 articles in one. Lightning seller. Sample free. Thomas Mfg. Company, 702 North St., Dayton, Ohio.

JUST show them—The new adjustable shoe and wall soap, dustless dusters and sanitary brushes sell themselves. Big line, big profits. Agents write Silver-Chamberlain Co., Dept. M, Dayton, N. J.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelties Cutlery Co., 67 Bar St., Canton, Ohio.

YOUNG Man, would you accept a tailor-made suit just for showing it to your friends? If you live in a town smaller than 10,000, write Banner Tailoring Co., Dept. 126, Chicago, and get beautiful samples, styles and a wonderful offer.

AGENTS—200% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Matthews, 442 North St., Dayton, Ohio.

AGENTE—Snuggled household line on earth. Red-hot sellers, steady repeaters. Goods guaranteed. Over 100% profit. Write quick—hurry. E. M. Feldman, Sales Mgr., 560 Third St., Cincinnati, O.

LADY or gentleman, fair education, to travel for well-established firm. No canvassing. Salary, \$356 per year, payable weekly, pursuant to contract. Expenses advanced. Address G. M. Nichols, Philadelphia, Pa., Pepper Bldg.

YOU can make big profits selling our Pure Aluminum Kitchen Utensils—Guaranteed for 20 years. Our specialties are not sold in stores, and they get the business for you. \$200,000 firm and liberal credit plan backs you. We have an attractive General Agency offer. Wm. J. Dick, Manager, Dept. A-21, 20 W. Lake St., Chicago.

AGENTS—Here's a winner. The Midget Vest Pocket Garment Hanger—sells on sight. The most attractive proposition ever offered. 150% profit. No competition as article is fully protected by U. S. and foreign patents. Address: Dept. "M," The Silver Company, 171 Madison Ave., New York.

MEN and women earn up to \$1,000.00 yearly distributing Guaranteed Heaters from wall to heater. All or part time. Repeat orders insure permanent increasing business. No capital or experience needed. H. Parker Mills, 2733 N. 12th St., Philadelphia, Pa.

LISTEN! Can you sell gasoline at one cent per gallon? If so, sell "Auto-Tonic." Gives 40% more gasoline mileage; disinfects carburetor. Auto owners grabbing for it. \$10 a day easy. Heats made \$25 first day. Act quick, man. Details free. White Mfg. Co., Dept. 112-B, Cincinnati, O.

AGENTS Wanted for Fireless Solder Cement—sticks aluminum and all metals; can be applied cold or with heat. Indispensable for housewives, automobiles and motorboats. Send 10¢ for sample and agent's proposition. Standard Purchasing Co., Dept. B, 10 Hancock Sq., N. Y. City.

SELL Luminous Crochet. "Shines all Night," to Catholic Institutions and families. Old Package Distributing Co., Philadelphia, Pa.

AGENTS can make \$10.00 a day by my plan. Particulars free. Send today. Tolley, 602 E. 15th St., Kansas City, Mo.

GRT proposition on Ford Electric Lighting outfit. Retail at \$3. Also Electric lamps for huggies at factory prices. Particulars, Box 135, Des Moines, Ia.

AGENTS to handle patented article. Bessa Novelty Co., 560 2nd Ave., N. Y.

EVERY housewife wants the one—every woman the other. We sell both. Master-ton Specialty Co., Cincinnati, O.

MAKE and sell a polishing cloth. Four sales pay 94¢ profit. My simple sales plan sold 1,500 in 30 days. Particulars for stamp. Higgins, 1742 North 34th, Omaha, Neb.

AGENTS, Mail Dealers, street men. Don't pass this proposition without investigation. New 10¢ article, sells at sight; costs \$2.00 per gross; send dime for sample. Terrell Co., 388 Willow St., Waterbury, Conn.

DISTRICT Managers, we are giving state rights for the control of the tap-stick-non-breakable gas mantle; new in America; lasts longer; throws greater light; the standard inverted burners; rapid seller. If you have a little capital, can handle sub-agents and see the trade, you can make from \$2,000 to \$5,000 yearly. L. Jules Electric Co., 209 West 45th St., New York.

AGENTS Wanted to sell a household specialty—needed in most every home; quick sales—big profits. Write today for proposition. Alpha Alcohol Utensil Co., 105 Hamilton St., Newark, New Jersey.

NEW Invention—Easy sales, 100% profit, couple hours spare time, \$5.00 daily. G. H. Pray Co., American Bldg., Baltimore, Md.

WAR Post Cards, 50 designs. Circular free. Ward Pub. Co., Box 432, Chicago.

GRT cash for names, information. Men, formulas. Turn what you see, hear and know into money. Instructive booklet for stamp. Information System, 221 Marietta, Ohio.

MAKE \$5.00 to \$25.00 daily selling Incomparable Winona Hosiery, Underwear, Sweaters. They have pleased thousands for years. Everybody needs them. Agents Iowa, Nebraska, Colorado, Montana, \$20.00 bill less valuable than answering today. Hunt, 943 16th Street, Denver.

AGENTS—Men and women, newest invention. Wing Self Heating Flat Iron; guaranteed, sells everywhere. Women delighted. Write for particulars. Wing Mfg. Co., 1608 Fulton St., Chicago.

LOOKING for just a job, or a large income? We have all the essentials for success: 1st, a monopoly; 2nd, a necessity to be in every 100, both men, women and children; 3rd, a monopoly; 4th, a necessity to be in every 100, both men, women and children; 5th, a monopoly; 6th, a necessity to be in every 100, both men, women and children; 7th, a monopoly; 8th, a necessity to be in every 100, both men, women and children; 9th, a monopoly; 10th, a necessity to be in every 100, both men, women and children; 11th, a monopoly; 12th, a necessity to be in every 100, both men, women and children; 13th, a monopoly; 14th, a necessity to be in every 100, both men, women and children; 15th, a monopoly; 16th, a necessity to be in every 100, both men, women and children; 17th, a monopoly; 18th, a necessity to be in every 100, both men, women and children; 19th, a monopoly; 20th, a necessity to be in every 100, both men, women and children; 21st, a monopoly; 22nd, a necessity to be in every 100, both men, women and children; 23rd, a monopoly; 24th, a necessity to be in every 100, both men, women and children; 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AGENTS—\$50 weekly: the only knife sharpener made on correct principle; wonderful seller; 157% profit; simple demonstration; no talking; general agents can make \$150 weekly; particulars free. 50c sample by mail. 25c. Thiele Co., 377 Austin Ave., Chicago.

OWN your own business. Make \$500 monthly. Carry no stock, just sample. S. O. S. Electric Pulver; new, powerful; making big money for agents. Write quick for special proposition. Commonwealth Mfg. Co., 466 Hinko, St. Louis, Mo.

SAFETY First—\$15.00 per day for 26 days equals \$390 monthly. We want agents to handle our guaranteed burglar-proof drop hinge door fastener. Can easily be carried in the pocket. A necessity for traveling men, tourists, housewives, hotel guests—in fact for every one that fears burglars or prowlers. Can be attached to any door. Details at 25c. 50% discount to agents ordering one gross or more. Samples sent postpaid upon receipt of 25c. National Mfg. Co., 149 Stevenson St., San Francisco.

AGENTS—Big profits selling our New Adjustable Electric Light specialty to offices, homes, stores, factories, hotels, etc. Greatest convenience and most practical device ever invented. Sells rapidly. Demonstration means sale. Write quick for excellent proposition and exclusive territory. International Automatic Utilities Co., 295 Old Colony Bldg., Chicago.

ACTIVE Agents—Something New—Household necessity. Experience unnecessary. Big profits. For full information, address: La Camera & Co., 312 W. Delaware St., Aurora, Ill.

SELL Eastland Disaster photographs. 8 samples. 30c. Peter A. Vinde, 1751 N. Whiggish, Chicago.

YOU are looking for more long green. You doubtless deserve it, and willing to work for it. Our soap and toilet article combinations have every ear-mark of being real coin getters. We can prove that they are. Write for convincing proofs. Davis Soap Works, 1161 Davis Bldg., Chicago.

AGENTS—Make \$40 a week selling our new patent self-wringing mop. Details \$1. Over 100% profit. Chicago Mop & Wringer Co. and Inc., 2736 Sangamon St., Chicago.

FREE samples for men and women agents: double your money selling Delmore's Napha Washing Tablets; washes clothes without rubbing; cleans floors, woodwork, pots, pans and dishes; polishes silverware; send for sample and particulars; not sold in stores. Manufactured and sold only by Napha Washing Tablet Company, 136 So. Dearborn St., Chicago.

\$25.00 TO \$50.00 per week easily earned in your home town by representing reliable concern, selling their line of household necessities. Exclusive rights granted. Apply at once. Dept. 29, Consumers' Direct Supply Co., 48 Hancock Street, Boston, Mass.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Effects credited. Prompt shipments. Low prices. Send for latest catalog and prices. Adams J. Knoll & Co., 682 Blue Island Ave., Chicago, Ill.

NEWEST wonder of the age! Silvers, the polish that silver-polishes. Actually rubs on sterling silver. Used everywhere. Sells on sight. Repeat orders. Big profits. Irrefutable. Secure now, introductory offer. Free sample. P. Carisa Co., 157 Cedar St., New York.

AGENTS: \$1,000 to \$1,000 yearly selling over eighty every-day articles to farmers. Pleasant, permanent business. Full instructions. Big chance. Write quick. Duform Factories, Duform Company, North Java, N. Y.

WINDOW Lettering Business. We start you free. Staebler Co., Dept. P, Long Island City, N. Y.

AGENTS, do not take any agency until getting free samples and plans on Ho-Ro-Co Skin and Soap and Toilet Articles. Our proposition different. Bathos, 212 N. 2nd, St. Louis, Mo.

AGENTS. Cost 2c, sell 25c. Gold window letters. Any one can apply. Samples free. Chicago Letter Co., 318 Alameda St., Chicago.

AGENTS—Brand new specialty Aluminum TripSeat Sauce Pan with detachable handle. Cooks 3 different foods on one burner. Saves gas. Lasts lifetime. \$1.00 to \$3.00 per month easy. Send for our catalog of 400 other specialties. American Aluminum Mfg. Co., Div. I, 10, Lemont, Ill.

MONTANOLA, concentrated perfume of the mountain. Youth restoring, health giving invigorant. Sample 2c cents. 3c per. Strong, Ward, Colo.

AGENTS—Salary or commission. Greatest seller yet. Every man, woman and child buys on sight. 200 to 500 per cent profit. One agent's sales \$829 in six days; another \$32 in two hours. Monroe Mfg. Co., X-6, La Crosse, Wis.

AGENTS—\$50 weekly. We manufacture the best needle case made; a wonderful seller; 200% to 500% profit; talking unnecessary; our "Trust Scheme" envelopes do the work; general agents can make \$100 weekly; particulars free; 25c sample outfit for 10c; buy direct from the factory. Pat Needle Co., 142 Davis Sq., W. Somerville, Mass.

\$1,000 PER Man per County. Strange invention startles world—agents amazed. Test inexperienced men divide \$10,000. Keenest, a farmer, did \$2,200 in 14 days. Schneider, a minister, \$135 first 12 hours. \$1,200 cold cash made, paid, banked by Sherman in 30 days; \$15,000 to date. A hot or cold running water bath equipment for any home at only \$45.00. Self-heating. No plumbing or waterworks required. Investigate. Exclusive sale. Credit given. Send no money. Write letter or postal today. Allen Mfg. Co., 4337 Allen Bldg., Toledo, Ohio.

\$15.00 MADE first day by 13-year-old boy with Shomescopes. Woman made \$8.00 first hour. Particulars free. Shomescopes Mfg. Co., 523 W. 10th St., Kansas City, Mo.

GET into your own business. Cut loose from day-offs, short hours and wage slavery. Our safety soap and toilet combinations have put thousands on Prosperity Road. Tremendous saving to consumer—200% profit for you. Send postal quick for details. E. M. Harp Co., 164 Davis Bldg., Chicago.

SELL Dry Goods Remnants. Greatest bargains on earth. Remnant Store Co., Cincinnati, Ohio.

We are the largest manufacturers of twisted Wire Brushes in America. Highest grade goods, best service, largest profits. Our new Auto Specials are winners. Send for catalog. Fuller Brush Company, Hartford, Conn.; Rock Island, Ill.

SELL Typewriters in your town. Good profits. Write me for wholesale prices and plan. A. E. Archibson, 1330 South Sawyer Avenue, Chicago.

NEW 1915 Model—Send no money. Just your name on a postal card, and learn by return mail how to get the best Vacuum Cleaner made, without costing you one cent. Shipped direct from factory, guaranteed for 5 years. Reliable. Free agents wanted. The Warner Company, Dept. 2, Muncie, Indiana.

AGENTS—Sell the Primus, genuine Swedish kerosene, coal oil stoves. Smokeless, odorless. Twelve the best of gasoline at one-eighth the cost. No danger of explosion. Big profits. James Anderson & Sons, Slinger, Ohio. American distributors.

AGENTS make big money and become sales managers for our goods. Fast office sellers. Fine profits. Particulars and samples free. One Day Pen Company, Dept. 2, Baltimore, Md.

READ the Agents Magazine and make more money. 2 issues 10c. Agent's Magazine, Chicago.

AGENTS—Air Cell Washing Machine. New, marvelous invention. Excess stock of washers costing \$25.00 and up. Sells only \$1.00. No wonder every home buys. Exclusive territory free. Nearly 200% profit. Write today. Air Cell Washer Co., 3037 Detroit Ave., Toledo, Ohio.

AGENTS—Average \$5 to \$12 daily selling stimulating Action massage machine. New. Just patented. Different. No electricity or water power required. Nothing complicated. Affords exhilarating massage without cost expense. Lowest price! Not best until. Details \$2.50 allowing you big end of the profit. Particulars and "beauty" folder free. Aztec Remedy Co., Dept. 132, Toledo, Ohio.

500% PROFIT selling our wonderful sign letters for office windows, store fronts and glass signs; resembles finest gold leaf; easily applied; samples free. Metallic Letter Co., 404 N. Clark St., Chicago.

AGENTS—Sell rich-looking imported 50c 68 Rug, \$1 each. Carter, Tenn., sold 115 in 4 days. Profit, \$57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post prepaid, 98c. London, Importer, Birmingham, Maine.

AGENTS make \$5 to \$10 a day on the start. Ackinsen writes: "The best proposition I have found in my forty years' canvassing." Permanent work. Household necessity. Selling 30%. Write today for General or Local Agents terms. Free sample. C. H. Stuart & Co., 16 Union St., Newark, New York.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfit. Emblem Checks, Check Pads, Name Plates. Hart Mfg. Co., Desk 2, 203 Degraw St., Brooklyn, N. Y.

YOU can be your own boss with our Key Check Outfit. Good for \$5 a day stamping names on pocket key checks, tags, etc. Sample check with your name and address, 15 cents. Pease Die Works, Dept. M, Winchester, N. H.

STUDY Here: Let me start you in a home business that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proofs. Voorhies, Desk C. E., Omaha, Neb.

Big Profits for You! Manufacture Harley Crisp. New Confection. 3c package costs you 1c. Machine, instructions complete \$7.50 prepaid. Send 10c for sample. Harley Crisp Co., 1345 Broadway, San Francisco.

AGENTS make \$100 monthly selling our 500 handy household articles. Catalogue free. Schott Company, Des Moines, Ill.

MEDALLIONS—100% profit. Make up your own goods and be independent. Catalogue free. Keane Co., 1305 Randolph St., Chicago.

Mail-Order Opportunities: 25 new propositions. No competition! Make 50c profit on dollar order; complete outfit 10c. Mail Orders Wholesale House, 421 Franklin Bldg., Chicago.

YOU can make \$333 as our general or local agent. Household necessity; saves 80 per cent; permanent business; exclusive territory; salary or commission; free sample; credit. J. Pitkin, 113 Bond St., Newark, N. Y.

AGENTS of ability and high character wanted on a new household article. Over 100 per cent profit. Special selling plan that pulls results. Address Merritt & Brock, 22 to 25 Temple Place, Boston, Mass.

AGENCIES WANTED

MANUFACTURERS: Wanted — General agencies for this section. No trucks, sister, Victor, Mont.

WANTED—Sales Agency, every state, sell newly patented push and pull door handle. Handle takes place of thumb latch, door knob. Fits any standard make lock. Big seller. Uni-Motion Co., 1308 Hartford Bldg., Chicago.

SALESMEN WANTED

LARGE folding house with Complete Line Attractive automobile accessories. Needs few more real salesmen who will carry samples of leaders and sell from newest most complete catalog of automobile supplies issued. Experienced men preferred but others considered if capable. Salesmen using car and making small towns will find this line convenient and profitable; also those selling hardware, electrical, harness, department stores, garages and automobile houses. You can try this out as side line, selling from catalog until you know your ground. Give full details, experience, territory, how often covered and lines handled. Replies confidential. Room 325, Tower Bldg., Chicago.

WE want high-class men to handle our Aday Ford Shock Absorber. The best and cheapest Shock Absorber on the market. An absolute necessity on a Ford Car. Guaranteed for two years. Fifty sales makes you \$1.40. McFarlane & Kress, Lakehurst, Ohio.

\$120 HAS been earned in 3 days by our representatives, some even better, introducing our new advertising method which solves the advertising problem for merchants in smaller cities and towns. If you are or want to be a salesman I will show you how to build up a big profitable repeat business quick. Whole or part time. Big money if you act now. Write Salesmanager, Window Cabot Company, 61 Congress Bldg., Boston, Mass.

SALESMEN — Make Big Money on our Convex Portraits 25c. Frames 25c. Glass 25c. Largest house in America. Est. 15 years. Samples Free. The Culver Co., Box 104, Westerville, O.

PERMANENT income from sale of Transo Transparent faced envelopes. Every business house a possible customer; Commission basis; local or traveling salesman. Transo Paper Company, Chicago.

WANTED—Traveling Salesmen who will accept clothes made to their measure in payment for playing with merchants "The line that's different," an all-wind tailoring line, getting six special prizes; no extra charges. Write for particulars, J. W. Jones & Sons, 520 Mid-City Bank Building, Chicago.

SALESMEN—We have some excellent territory open to salesmen of ability. This is a proposition that appeals to the best class of concerns. Sales are easy and your profits large. Write us today for catalogue P. 30., covering the Schick All-Steel Paper Holer, Davenport Mfg. Company, Davenport, Iowa.

Big Opportunity for Hunting Salesmen. Selling Simple Two-Compensation Starters for Foods. \$11. Guaranteed to start, fixed demand. Salesmen with words preferred. Write Sandhill Starter Co., Desk A, Rock Island, Ill.

SALESMEN: Acquainted with merchants. Large demand. Lab. comm. Pocket samples. Write Salesbook Co., Chicago.

SALESMEN—Sell 26x36 Arkcraft Felt rugs as a side line. Kelso, Battle Creek, Mich., sold 30 dozen last week—his profit—\$80. Wholesale price \$13.50 per dozen on 30 days. Sample prepaid \$1. Exclusive territory. J. J. Condon, Mfr., Birmingham, Maine.

HELP-A-PHONE—Salesmen make \$100 weekly. Write Edmund, 415 Belden Ave., Chicago.

WANTED—Hustlers to take orders for made-to-measure high-grade men's tailored suits from \$9.00 to \$22.00. Make \$25.00 to \$50.00 weekly. Elegant large look outfit free. Experience unnecessary. No pocket folder affair. Splendid opportunity to make money. Handy Dandy Line. Dept. S, Kensington St., Chicago.

GREAT opportunity for General Agents selling New Specialty to merchants. Retail \$5, \$10, \$15 each. Your profit 200%. No competition. Exclusive territory. Free samples. Sayers Co., 408 Wainwright, St. Louis, Mo.

SALESMEN, Agents, everywhere: New auto fuel. Permanent, profitable. Tankful Chemical Sales Co., Cleveland, Ohio.

WANTED—Representatives everywhere. Exclusive territory. Gold sign letters for stores and office windows. Any one can put on. Write today for free sample. Metallic Letter Co., 403 N. Clark St., Chicago.

HELP WANTED

MEN wanted to make Toy Soldiers. War stopped importation. Profitable home work. Great business in larger scale. We buy all the soldiers if not sold direct to stores. Greatest demand till Christmas. Tools, experience unnecessary. Moulder, pattern list free. Toy Soldier Manufacturing, 32 Union Square, New York.

CONFIDENTIAL Information Wanted: High-grade opportunity; no canvassing; spare time; confidential; good pay. Write for complete particulars "Alto," Pmc, Evansville, Indiana.

CO-OPERATE with me in your spare time. Big legitimate business: \$25.00 to \$50.00 weekly; no canvassing; write. Y. L. Meade, 24 E. 21st St., New York.

SILVERING mirrors. Plating talcware, auto-brass. Home booklet plans free. Clarence Sprinkle, Dept. 28, Marion, Ind.

DRAFTING—Ink-bottle holder. Price 10c. F. P. Laice, 115 Fargo, Buffalo, N. Y.

WANTED—Circular Distributors. Send 10c for Application Card. Sample Magazine. Oliver A. Barkley, Mount Pleasant, Pennsylvania.

GET a Government Job! See ad on page 33. Write now—today! Patterson Civil Service School, Rochester, N. Y.

WANTED—Men to get members and establish lodges on commission basis for the Owls. South Bend, Indiana.

MEN and Women Wanted Everywhere. Government Jobs, \$70 monthly. Short hours. Vacations. Rapid advancement. Steady work. Write immediately for list of positions now obtainable. Franklin Institute, Dept. A-21, Rochester, N. Y.

OWN a business. Co-operate with me openings at home. Everything furnished. Don't worry about capital. Boyd H. Brown, Dept. K-9, Omaha, Neb.

BECOME Detective. Large salaries; easy work. Write Chief Wagner, 1243 Lexington Avenue, New York.

FREE Illustrated Book tells of about 300,000 unoccupied positions in U. S. service. Thousands of vacancies every year. There is a big chance here for you, sure and generous pay, lifetime employment. Just ask for booklet S-29. No obligation. Karl Hopkins, Washington, D. C.

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LEARN Automobile Trade in reliable school. Overhauling, ignition, machine shop work, driving up-to-date cars. Special Examination rates. Many positions secured. Board and room while learning. Catalog free. National School of Engineering, Los Angeles, Cal. 1935.

BEFORE undertaking one of the mail order promoters' "Get Rich Quick" plans, write us for information. It costs you nothing and will save you many dollars—Ray & Co., Box 7637, Oakland, Calif.

SPEND summer gathering friends, hucksters. I pay good prices for specimens properly prepared. Many worth \$5-\$7.00. Hundreds salable. Men, Women, Boys. Send stamp for particulars. Sheldahl, Box 211, Los Angeles, Cal.

FINEMEN, Brokenmen Wanted, all talents, \$120 monthly. Experience unnecessary. Railway Association, Dept. 298, Brooklyn, N. Y.

EARN \$20 weekly collecting names and information. What you see, hear and know is worth money. Send stamp for instruction booklet. Information System, 570, Marietta, Ohio.

MEN—Become Railroad Private Detectives—particulars for stamp. W. Brook, 1321 Ave. A, New York.

YOUR services are needed as Topographic Draftsman at excellent salary. You can learn from us soon. Get particulars, Columbia School of Drafting, McLachlen Bldg., Washington, D. C.

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MEN—Become Chauffeurs. \$15 week. Earn while learning. Sample lesson free. Franklin Institute, Dept. A-202, Rochester, N. Y.

MAKE \$25 a month extra, reporting sales information. Detailed, fascinating, spare-time work. Send stamp for particulars. National Enterprise Association, 37 Revere St., Portland, Maine.

DISTRIBUTORS Wanted—Good pay; steady work; giving away packages Perfumed Floral Soap Powder with Soaps, etc. No capital or experience needed. S. Ward & Co., 225 Lafayette Pl., Chicago.

WRITE Moving-Picture Plays. Good prices. Receive all or spare time. No correspondence school. Details free. Atlas Publishing Co., 3045, Cincinnati.

MEN to refresh lighting fixtures, brass beds, etc. All or spare time. No capital or canvassing. Experience unnecessary. Information free. Commercial Co., Dept. G, Decatur, Ill.

BE a Detective—Earn from \$150.00 to \$300.00 per month. Travel over the world. Write C. T. Leding, 310 Westover Building, Kansas City, Mo.

STOP Here! Let me tell you in a few minutes that will bring you money every day. Experience unnecessary. Spare time. No canvassing. I furnish everything. Send for proof. Yearlies, Desk C. R., Omaha, Neb.

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GO on the Stage. Vanderbilt career offered you. Experience unnecessary. Managers endorse my method. Indiscrete trouble-free book free. Write today. Fredric LaFollet, Box 10, Jackson, Mich.

RAILWAY Mail Clerks Wanted. \$70 monthly. Examinations coming everywhere. Specimen questions free. Write immediately. Franklin Institute, Dept. A-21, Rochester, N. Y.

GOVERNMENT Examinations. Most thorough preparation, \$1; returned if not appointed; particulars free. American Civil Service School, Washington, D. C.

PHOTO-Plays Wanted. Big prices paid. We show you how. Details free. Rex Publishers, Box 1768, Chicago.

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MERRY-GO-ROUND, cost \$5,500.00, sell \$1,200. Vacuum House Cleaning Wagon, cost \$1,500.00, sell \$400. For particulars write B. W. Stokes, Dover, N. J.

B. H. P. DE LUXE V-type cycloear motor; Atwater Kent ignition; Stromberg carburetor. Brand new, \$50. H. L. Whitcomb, 64 May St., Springfield, Mass.

First sale or Trade—15 pairs roller-rink skates in first-class condition. \$15.00 cash. Wm. Von Mueller, Marble, Colo.

TYPE and Printing Material at bargain prices. Now is the time to buy. All sizes rebuilt Job Presses, very cheap. Catalogue free. Philadelphia Printers Supply Co., 11 So. Fifth St., Philadelphia.

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15-LIGHT Acetylene Gas Plants, Generator, Fixtures, Chandeliers, Pipe, Height or than Electricity. Fully guaranteed, easily worth \$60.00. All complete for \$25.00. Write Daniel Zimmerman, Magler, Ind.

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FOR Sale—Waterpumps, perfect order. \$75 cash. Box 579, New Bedford, Mass.

THREE electric shoe-shining machines, money makers. Will sell at sacrifice. Write for prices. Joe Gough, Ellenville, Miss.

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FIELD and Marine Day and Night Glasses with sunshade and case. 25 mile adjustment. \$20 value, only \$7.50. Write for our telescope and binocular list. Wells Country Shop, 20 S. Second St., Philadelphia, Pa.

VACUUM cleaner pumps and parts for assembling, save 75%. Vacuum Supply Co., Ann Arbor, Mich.

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SELL cheap or Trade—Amusement business, cakemark, kutterack, shooting gallery, amusements, games, conch, tents, etc. Big money-maker County Fairs, Carnivals. Want auto, late motorcycle, or what have you? Garrett Fords, Cudia, Ohio.

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PEERLESS famous combination spring exercisers with patented grip handles. Just the thing for athletes, business men, women, boys or girls. All the gymnasium advantages in your own home. Prices \$5 to \$4.00. Five styles, three tensions. Send for complete manufacturer's catalogue. Peerless Athletic Supply Co., 383 Pearl St., Brooklyn, N. Y.

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GLASS Cutter, improved type; cuts any thickness. Saves labor, time, money. Saves the hands. 10c. Smith & Hemenway Co., 1518 Chambers Street, New York City.

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AN advanced method of thread cutting in the lathe, with two typewritten blueprint charts of tap drill sizes, 25 cents. J. A. Campbell, M. M., 506 Nassau Bldg., Denver, Colo.

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VACUUM Pumps and Cleaners. All sizes; complete outfits. Thurman Vacuum Cleaner Co., manufacturers. Dept. O, St. Louis, U. S. A.

J. H. P. STOVER Vertical Gasoline Engine, Lloyd Bros., Doylestown, Ohio.

TOOLS, guns and flatirons never rust if immersed in oil. Metal box of six fast indefinitely. Ten each. Stand. Box 13, Cedar Falls, Iowa.

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LATEST Tricks, Puzzles, Jokers' goods, Pocket novelties, Zappella balloons, floating water balloons, trick cigarettes, cigars, trick matches, smokes and high powder, slick bombs, 200 others. Send 2c for latest catalogue. Get acquainted with our goods and prices. J. Granichselt, Mfg., 1238 Thurlow Avenue, Bronx, New York.

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HANDWRITTEN, Bond Letterheads and Envelopes, 100 of each, and 100 white were return envelopes, \$1.00 postpaid. Samples free. Toledo Press, Box 1810, Toledo, Ohio.

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PRINTING Presses, Type and Supplies. Low prices. List for change. Popular Bargains, Highland, Pa.

PRINTING OUTS. cards and paper, \$40. O. Swingle, Freeport, Fla.

4,000 GUMMED labels 1x2 1/2. Printed two colors, \$1. Label Shop, 180 Meadow St., New Haven, Conn.

500 6x4 WHITE circular envelopes \$1 postpaid. Acme Supply Co., Lexington, Ky.

AN 8x10 Printing Press can be made with our copyrighted instructions at total cost of only \$1. Does practical work. Full instructions with drawings and a \$5 "Cut and Engraving Course." 25c. Burroughs Supply Co., Argos, Ind.

LETTERHEADS—1,000, \$2; 2,000, \$1.50; 3,000, \$1.50; good grade bond paper, 16 pound; others charge more for same quality; samples free. Grand Job Shop, Dept. 3-L, Grand, Kas.

MULTIGRAPH Letters, Letterheads—1,000 complete, \$3. Letters purple, heads black. Samples for stamp. Perfection Letter Company, Muncie, Indiana.

ADVERTISERS—Here's your opportunity. 25 word classified ad inserted in "Cartoons Magazine" for 50c; one inch display ad \$1.25. 20,000 copies guaranteed. Send in your ad for the next issue. Cartoons Classified Dept., 78 E. Madison St., Chicago.

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1,000 BOND Letterheads, 8 1/2x11, \$1.00. Samples free. Burton Bros., E. Louisville, Ky.

50 CALLING Cards, 10c. 25 Envelopes, 10c. F. Shepard, Rome, N. Y.

1,000 BOND Letterheads, Envelopes, Cards, Circulars, \$1.75 up. Perfect imitation typewritten letters, \$1.50 complete. Quick Delivery, Get Samples, Franklin Press, Waukegan, Ill.

PRINTING Outfits—Presses, type, supplies, type novelties. Send stamp for catalogue. Model Press, York, Penna.

GOOD Printing at low prices. 1,400 good letterheads, envelopes, cards, billheads, labels, circulars, \$2.50. Samples free. Catalogues, booklets, and circulars our specialty. Ernest L. Pantan Co., 633 S. Dearborn St., Chicago.

50 WEDDING Invitations, engraved script style, double envelopes, \$3.50. Transparencies prepaid. Samples free. Canterbury Press, 215 Federal, Camden, New Jersey.

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SAFETY razors sharpened; two cents each. Guaranteed. Blade box free. Electro Sharpening Co., 124 Shelby St., Detroit, Mich.

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"PATENTS and Patent Possibilities" is a 72-page treatise which tells all about patents, what to invent and where to sell it. It gives honest advice to inventors, and is full of valuable and interesting information. Write for it today! It is free. H. S. Hill, 925 McLaughlin Bldg., Washington, D. C.

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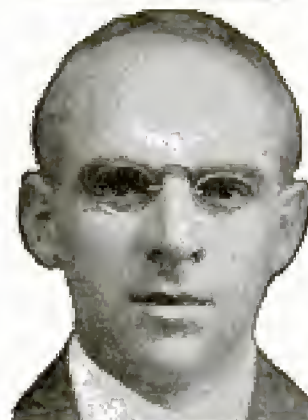
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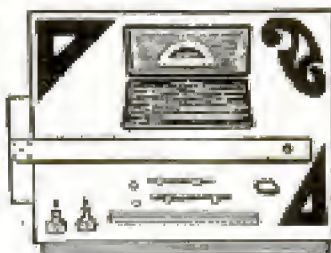
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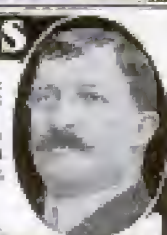
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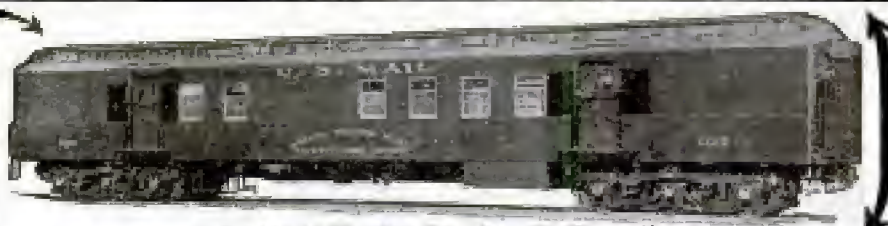
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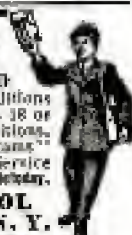
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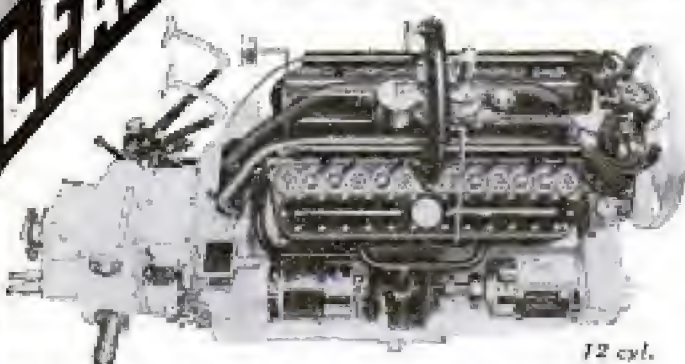


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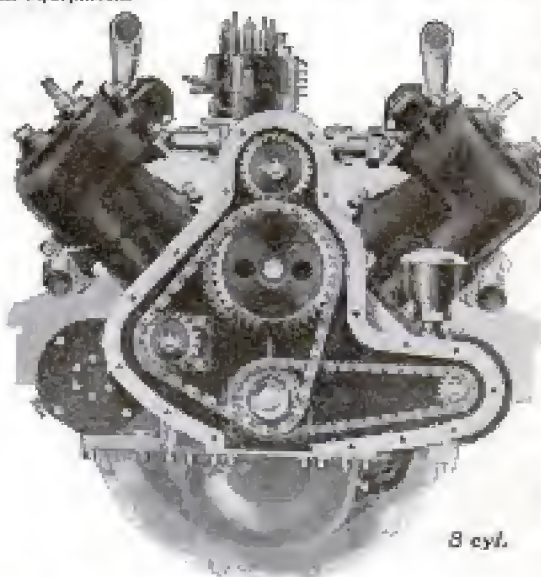
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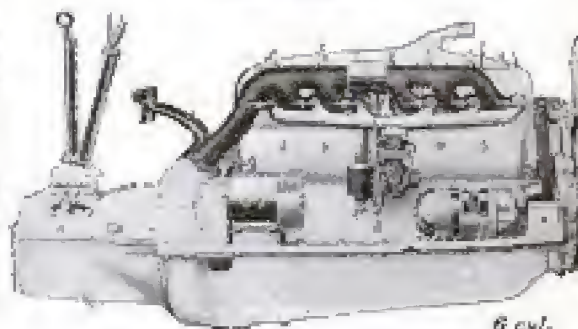
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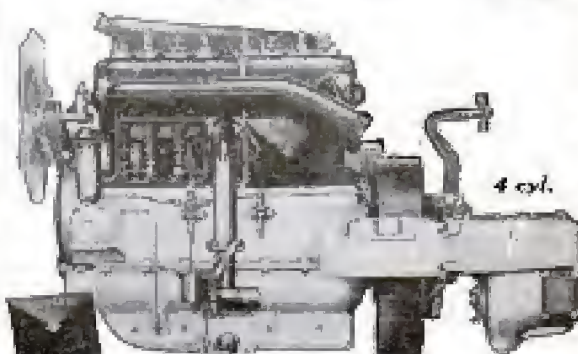
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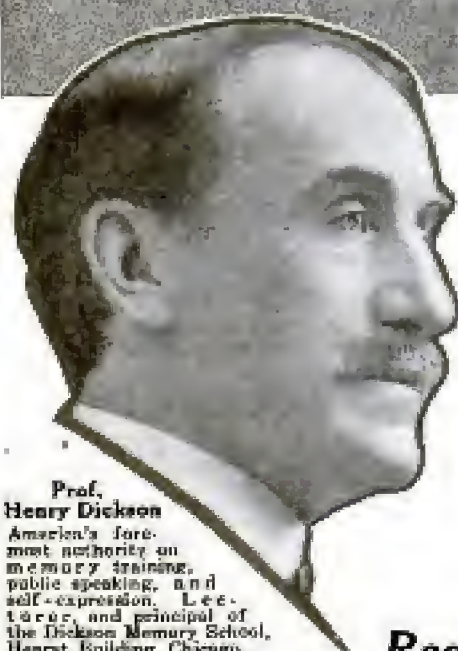
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YOU, young man in college—or ambitious worker taking a correspondence course—are you getting the most out of your study? Do you remember what you learn? No education in the world can help you unless you have a good memory. My memory training will make your learning a permanent possession.

John Van Dyke of Carbondale, Illinois, writes:

“I have just finished your memory training course and I must say that the value of this course can not be over-estimated. Your instructions are of more practical value to students and business men than years of training in the average school. Anyone who studies and applies your method will find it the best method of securing an education.”

Elbert Hubbard Says: “Good Memory is necessary

Memory of Life



The Key to Success

In Social Life



The Memory Trained Man is Never Bashful or Self-conscious

ARE you at ease in society? Can you converse easily and naturally—say the right thing at the right time? My method teaches self-expression—how to talk in society—how to converse intelligently regarding books, novels, etc.

Roland Miller of New York City, writes:
"What I have gotten from your method has advanced me both socially and financially and I feel it my duty to tell you of these excellent results."

The Public Speaker



At Ease Without Notes

THE man in public life must be able to think on his feet—to express himself clearly, logically. Thousands of public speakers can testify to the value of my course in memory training.

Carl F. Schader, one of California's biggest men, writes:

"I have been improved physically and mentally beyond my own expectations by the continued study of your course. Every business man, especially those called upon to talk at Chambers of Commerce, realty boards, advertising clubs and other meetings should take your course. I unhesitatingly recommend it to my many friends."

(In 1914, Mr. Schader had an option on the sale of a \$2,000,000 ranch. In a five-minute interview granted him by Mr. Frank A. Vanderlip, President of the largest bank in the U. S., Schader so clearly presented the salient features of the property that the interview was extended and the sale finally made. Schader succeeded because he had the ability to concentrate and to remember.)

Dickson Memory Training Has Helped 50,000 Others—Why Not You, Too?

I have helped thousands—men in every walk of life—men with exceedingly poor memories who have developed them to amazing perfection—men with remarkably good memories who have made them much better. What I have done for these men, I can do for you—can teach you to think and talk connectedly. I can make your mind an infallible, classified index from which you can instantly select facts, figures, names, faces, arguments. My course will enable you to concentrate, develop self-control, overcome self-consciousness, think on your feet and intelligently address an audience without notes. Think what this means—a better position—bigger pay—social and business success—the efficient life.

Special Offer—"How to Speak in Public"—FREE

This deluxe, handsomely illustrated, richly bound book—with introduction by Elbert Hubbard and appendix by Orison Sweet Marden—a book regularly priced at \$2.00—I will present to every student who enrolls at once for the course in Memory Training—absolutely free. The book will train you to think on your feet—to express yourself clearly, logically and convincingly whether talking to one person or a thousand. Get full particulars of this liberal offer at once.

FREE Wonderful Book On "How to Remember"

Simply send your name and address on the coupon or a postal for this remarkable book. No charge—no obligation. Together with the book I will send my copyrighted Memory Test—a test which has a direct bearing on your business success. Get this free book—get this Memory Test—find out TODAY just how my course can help YOU—in your battle for SUCCESS.

Henry Dickson, Principal
Dickson School of Memory
705 Hearst Building, Chicago, Ill.

This Book—FREE

Prof. Henry Dickson, Prin. Dickson School of Memory,
705 Hearst Building, Chicago

Please send me free of charge and without obligation your booklet "How to Remember"; also your remarkable copyrighted "Memory Test". Give me facts on your special offer of a free copy of "How to Speak in Public."

Name _____

Address _____

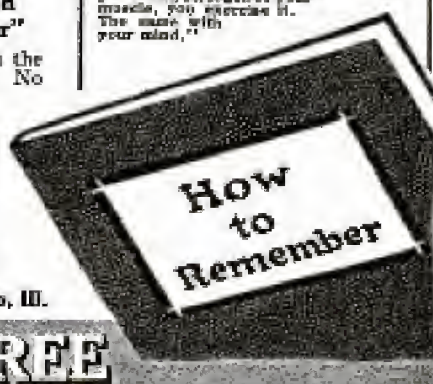


Elbert Hubbard Says:

"Good Memory is necessary to all achievement. I know a man who is fifty-five years old. He is a student. He is a graduate of three colleges, and he carries more letters after his name than I care to mention. But this man is neither bright, witty, clever, interesting, learned nor profound. He's a dunce. And the reason is that HE CAN NOT REMEMBER. Without his notes and reference literature, he is helpless."

"EDUCATION is only what you remember. Every little while in business I come across a man who has a memory, a TRAINED MEMORY, and he is a joy to my soul. He can tell you when, where, why, how much, what for, in what year, and what the paper said the next morning. Like this man is another, the general manager of a great corporation in a western city. He never misses a fact. If he sees you once that's enough. The next time he'll call you by name, inquire about the folks at home, and ask if you have recovered from that touch of rheumatism. He told me how he did it. He told me that he studied memory training with Professor Dickson, of Chicago. Also, he said a lot of nice things about Professor Dickson, that I hesitate to write down here lest my good friend Dickson object."

"This Dickson System of Memory Training, as I understand it, and I do understand it, is very simple. If you want to enlarge your arm to increase the power and strength of your muscles, you exercise it. The same with your mind."



to all achievement"

Men Wanted

To Fill Positions Paying
\$75 TO \$300
PER MONTH

Six weeks from the day you commence your studies in this great practical school, you will be able to repair any make of automobile and to drive any car on the market.

Prepare yourself to earn a salary of from \$75.00 to \$300.00 per month; or to go into business for yourself as a garage owner or automobile agent and make from \$2,000.00 to \$5,000.00 a year.



Graduates of this school are in demand. Many of our graduates are to be found in high-salaried positions in some of the largest automobile factories in the country. Many are in business for themselves and are making big money. Ask us to prove that the Automobile Training School of Kansas City, Mo., has more graduates holding responsible positions than all other automobile schools in the West combined.

No Books Used No Tools to Buy

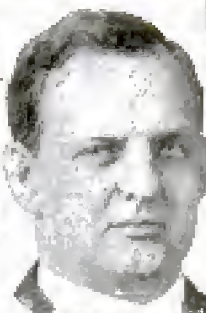
The Automobile Training School has no illustrated books and offers no charts or correspondence courses. Our students receive individual practical instruction under practical conditions on up-to-date automobiles and motors from the best instructors that we can secure. This school, we claim, is the largest in the world, occupying three big buildings, operating two of the principal garages and repair shops in Kansas City. We claim to have more floor space, more instructors, more equipment than any other Automobile School in the United States.

\$50 Scholarship Free

As a very special inducement to enroll the full capacity of our school without delay, we are including with our regular automobile course, absolutely free of any charge, our big new combination in Tractor and Station Engineering. We will only offer a limited number of these free scholarships. If you wish to take advantage of this special offer, write today. We will send you free and postpaid, copy of our big sixty-page book, "How To Make Money In The Automobile Business"—filled with scores of illustrations from our school, and letters from successful graduates all over the world. Sign your name and address on the coupon below, and mail it now.

HENRY J. RAHE, President

Automobile Training School
1094 Locust St. KANSAS CITY, MO.



H. J. RAHE, President
Automobile Training School
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123
456
789

Place the 9 figures on the 2nd row is twice as much as top row and bottom row as much as top and 2nd row added together. All correct replies will receive 25 cents' worth of our iron puzzles with catalog postpaid. Answers not correct will receive solution. Catalog of 200 puzzles and one of our leading 15c. products. All answers to puzzles 10c. in stamps or coin to cover mailing, packing, etc.

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ST. HELENA TRAINING STATION INFANTRY DRILL

The Value of Navy Training

¶ The training a young man receives in the U. S. Navy will be of the greatest help to him in his later career. At the Navy Training Stations, where all apprentice seamen go, the recruit receives a practical course of instruction for a period of six months before being assigned to sea duty. The drills are interesting, the life is healthy and invigorating, and the work is not arduous.

¶ There is plenty of time for play, and plenty of recreation, boxing, baseball, track athletics, swimming, rowing, sailing, and "movie" exhibits.

¶ Besides seamanship, many trades are taught in the Navy. The man-o'-war of today needs skilled artisans, and the Navy trains its men to fill these jobs.

¶ The sea has always possessed a fascination for adventurous young men, and this fascination has now lessened by the modern equipment of the dreadnaught, with her powerful radio, her excellent messing arrangements, her shower-baths, her steam laundries, and countless other improvements for the comfort of the enlisted men.

You'll be interested in knowing more about the Navy. Recruiting stations are located in nearly all the cities. Look up the address in the want columns of the daily papers, visit the nearest office, and have a talk with the men there. Or write to—Box 65

BUREAU OF NAVIGATION
NAVY DEPARTMENT WASHINGTON, D. C.



Beautify Your Home With JOHNSON'S PREPARED WAX

—It Cleans, Polishes and Finishes

with one application. Try it on your furniture or piano—you will be surprised at the wonderful improvement. It gives **Craftsman** furniture that soft, artistic polish so appropriate to this style. Johnson's Prepared Wax entirely removes the "cloudiness" from **Mahogany** furniture, restoring its original gloss.

Keep your **dining room table** bright and tempting—it will give an added charm to your home. Hot dishes have no effect on tables polished with Johnson's Prepared Wax. It never becomes sticky or tacky in the hottest weather or from the heat of the body, consequently does not gather dust or show finger prints.

Every family has dozens of uses for Johnson's Prepared Wax. It is just as necessary around the house as soap. Keep a can always on hand ready to clean and polish your

Floors
Linoleum
Woodwork

Piano
Furniture
Leather Goods

Golf Clubs
Automobile
Gun Stocks, etc.

It is unsurpassed for all of these purposes. Johnson's Prepared Wax is clean and easy to use and economical. It is conveniently put up—always ready to use—no tools or brushes required—all you need is a cheese cloth rag.

S. C. JOHNSON & SON, Racine, Wis.

PA9

I enclose 10c for a can of Johnson's Prepared Wax—sufficient for polishing several pieces of furniture, a small floor or an automobile. Also send booklet on home beautifying.

Name

Address

City & State

Johnson's Prepared Wax is for sale by all dealers. If yours cannot supply it send 60c for a pint by parcel post, prepaid—enough for a season's use—or use the coupon for a trial can.

We shall be glad to send you gratis a copy of our beautiful new 25c color book "The Proper Treatment for Floors, Woodwork and Furniture." It is full of valuable ideas on home beautifying. No library is complete without it.

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Celle, Hannover, Germany.
Popular Mechanics Magazine

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WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 24

SEPTEMBER, 1915

No. 3

*Berkefeld Filter Co. (any office room)
 4-6 Cedar St., New York.*

9777 **Camper's Filter Pump Purifies River Water**
"Die Uratschau"

BY the invention of a filter pump one of the most serious inconveniences encountered by motorists and sportsmen, that of obtaining pure drinking water in sparsely settled districts during hot weather, is obviated materially. With this device clear water may be drawn from any lake or running stream and used with greater safety than can that taken in the usual manner from shallow wells.

The pump is made compactly and may be added to the equipment of a motor-car kitchenette cabinet or carried by a hunter in a haversack. The lower end of the intake pipe is covered with a fine-mesh strainer. The water is drawn through this by the upstroke of the piston and on the downstroke is

forced into a chamber containing the filtering agent, which consists of infusorial earth mixed with a binding material. From this cylinder it is dis-



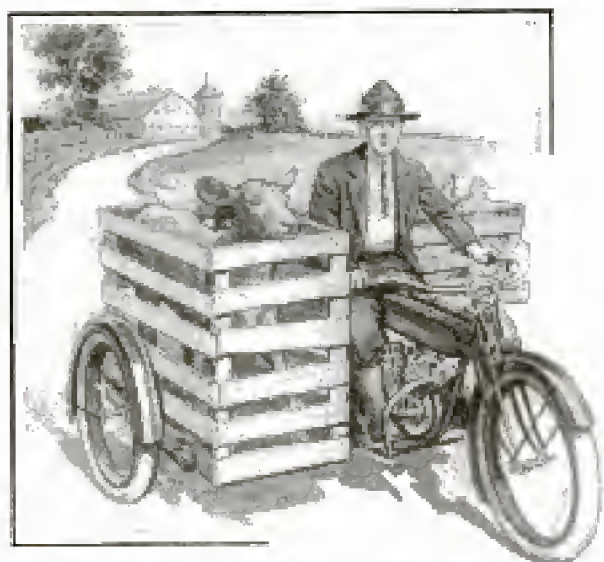
With This Pump All the Drinking Water Desired may be Drawn from Lakes and Streams Encountered by the Motorist or Sportsman

charged through a nozzle. Fixed to the device is a supporting leg which, when set on the bank of a stream, allows the operator to stand nearly erect while drawing water. Although for ordinary touring, this device is not re-

quired, it is very convenient on long trips and makes the sparing use of water carried in vacuum bottles needless. Water passed through the filter is sufficiently purified to be used with safety.

85
**NOVEL USE FOR MOTORCYCLE
FOUND BY FARMER**

Quite an unusual employment is made of a motorcycle and sidecar by a Missouri farmer and stockman who has converted the vehicle into a quick-



Carrying Live Stock and Poultry 31 Miles to Market on a Motorcycle

delivery machine for carrying certain products to market. By securely fastening a crate over the rear wheel and placing another one on the chassis of the sidecar, he is able to transport a considerable load with dispatch and without particular difficulty. His country place is more than 30 miles from St. Joseph, but with this delivery van he recently carried a calf and a dozen chickens to market and returned within a few hours' time.

230
**ONCE-FAMED GOLDFIELDS
NOW NEARLY DEPLETED**

Quite an interesting investigation of the Klondike and Yukon goldfields, which only a few years ago were known throughout the world, has recently been reported by the Smith-

sonian Institution. The conditions in these districts today are in striking contrast to those met by the adventurers who poured into the region in thousands when the rush was at its height.

In 1900, the production of gold amounted to \$22,275,000. This was the most successful year and was followed by a sharp decline. After hydraulicking and dredging were commenced, however, the output again increased, and during 1913 gold amounting to \$5,018,411 was recovered. Of the \$180,000,000 of ore estimated as originally available, only about \$20,000,000 still remains to be mined. And in this connection it is also interesting to observe that Dawson City, which in 1899 reached a population of 25,000 persons, now has less than 2,000 inhabitants.

The inquiry has shown, however, that although the Yukon district no longer holds riches for the placer miner, it does contain a considerable amount of alluvial gold which could be recovered with capital and an exercise of brains.

273

**BRITISH COLONIES PROVIDE
CRAFT FOR FLYING CORPS**

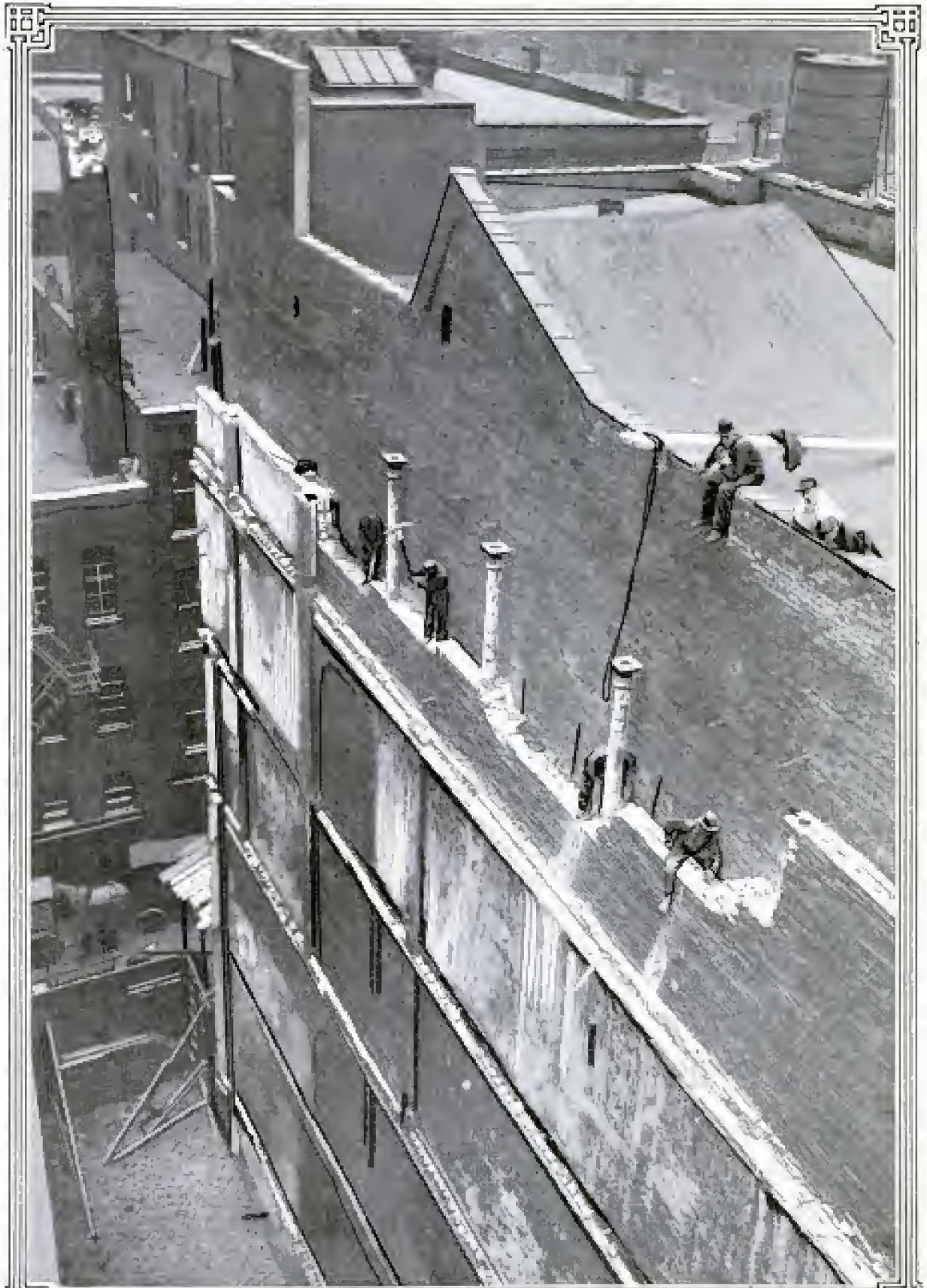
Through the endeavors of the Overseas Club, which is enlisting financial aid from British subjects the world over, a flotilla of new air craft is being supplied to the Royal Flying Corps. Appeals are being made to every British colony to contribute machines. Six "over-seas" aeroplanes have already been sent to the front, while promises of craft have been received from Hong Kong, Nova Scotia, Saskatchewan, Gibraltar, the British West Indies, South Africa, and New Zealand. In each instance the machines contributed by a district bear its name.

Smithsonian Institution

Overseas Club,
General Bldg,
Aldwych, London W.C.

176

WORKMEN WRECKING WALL THRILL WATCHERS



IN tearing away one of the walls of an old building which was being wrecked at Chicago, a number of workmen thrilled a small group of onlookers by the method they used in executing their task. With a clear space of 60 ft. beneath them and without safety ropes or scaffolding, the men equipped with picks worked on the top of the narrow ledge, removing the bricks one by one from under their feet. Despite the danger, the wall was torn down without mishap.

International News Service
238 William St.
New York
326 W. Madison St., Chgo.

GENERAL SAVING IS RESULT OF WOOD-WASTE EXCHANGE

Through the establishment of a co-operative exchange system whereby manufacturers are put in touch with each other, the Forest Service of the Department of Agriculture has been able to lessen the amount of lumber wasted by woodworking concerns. Some 200 different firms are now enrolled in the "wood-waste exchange." This membership consists both of companies having certain kinds of waste wood for sale and factories in the market for such products. As a result of this endeavor, many mills and factories which were formerly forced to burn their waste or dispose of it as firewood, are now selling it at legitimate prices.

MUNICIPAL PIER IS BUILT AS MOTOR-PARKING SPACE

In order to provide adequate parking space for motor cars at one of the public beaches at Venice, Cal., a municipal pier has been built out over the breakers. It has sufficient room to ac-

commodate approximately 700 machines without crowding and is under the supervision of traffic policemen. Broad driveways are marked off by white lines before the double rows of cars, so that even when the space is taxed to its capacity a vehicle may be driven in or out without requiring other machines first to be moved. The approaches to the pier are paved, while the piles supporting the structure, which it is estimated could bear an aggregate load of about 5,000,000 pounds, are set in concrete bases.

CHEMICALS FOR PURIFYING 140 AIR IN SUBMARINES

In demonstrating a new chemical invention for purifying the air within a submarine the inventor remained for seven hours in a sealed and submerged box that contained only enough air to sustain life unaided for a period of about half an hour. The box was 6 ft. high, 4 ft. long and 3 ft. wide, and the demonstration was carried out in the presence of experts of the United States and Russian governments. The

Al. G. Waddell, 15 Mildred Av., Venice, Calif.



On This Municipal Pier Motor Cars may be Parked without Charge



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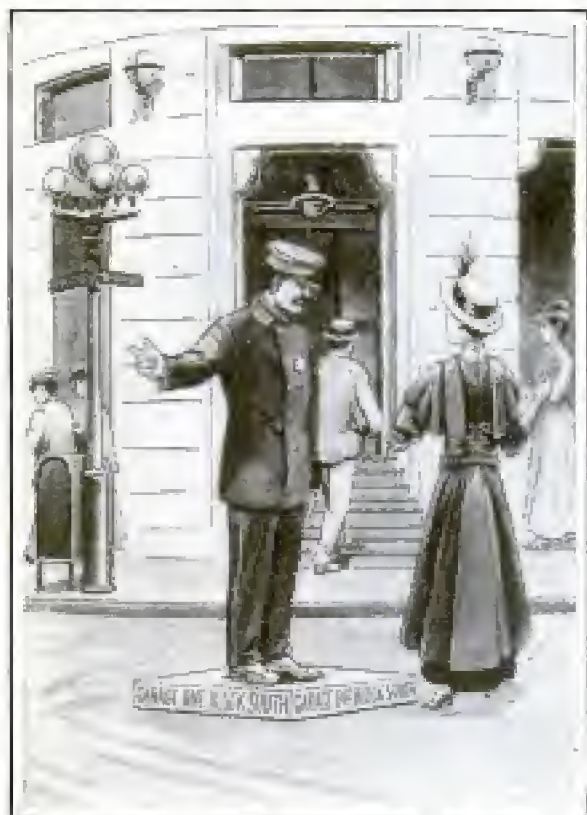
The Picture at Left Shows the Interior of Sealed Box, and That at the Right the Telephone and Air-Testing Apparatus Outside the Tank; the Inventor Who Went through the Test is Shown at Top

inventor entered the box dressed in a bathing suit, taking with him a stool, chemicals, food, reading matter, and air-testing apparatus. The box was then sealed and lowered into a larger box, which in turn was lowered into a tank filled with water. Both the boxes were provided with glass tops so that the inventor was in full view throughout the test. The interior of the box was equipped with an electric lamp and fan, while communication with the observers outside was provided by means of an improvised telephone. Tests of the air were made at regular intervals. Whenever the tests showed the percentage of oxygen to be getting low and that of carbon dioxide high, the

inventor simply released a fresh supply of the chemicals, with the result that the oxygen was immediately increased and the carbon dioxide diminished. At the expiration of the seven-hour period the water was drained from the tank and the box was opened. The inventor climbed out of the box unaided and had apparently experienced no ill effects. The nature of the chemicals has not been made public, the inventor simply explaining that they instantly absorb the carbon dioxide exhaled from the lungs and supply new oxygen. He believes that the chemicals can be produced in such quantities and at such a price as to be available for submarines.

TRAFFIC OFFICERS' ISLANDS ADVERTISE CITY COMPANY

Edholm
At Los Angeles, Cal., a business firm recently took advantage of an oppor-



Novel Advertising Medium of a Los Angeles Business House

tunity for valuable street advertising and supplied the police traffic squad

with comfortable standing platforms. These were made approximately 18 inches square and four inches high, and filled with a composition material containing cork. The blocks were bound by blue and white enamel signs bearing the name of the donor company on two sides and calling attention to its location on the others.

COACH CAFE CAR IS BUILT AS 194 AUXILIARY DINER

For the accommodation of passengers on trains which do not carry standard dining cars, an eastern railway company has placed in service a day-coach café car. This departure is purely experimental, but if it meets with success, similar cars will be equipped and put in operation over the system. A compact buffet, fitted with alcohol broilers instead of coal stoves, occupies a space approximately eight feet in length at one end of the car. The meals are served on tables placed between the seats and supported on the arms. Both single and double tables are provided, the latter being used when two seats are faced. In other respects the car is the same as an ordinary steel coach. Breakfast is served in the Pullmans from this car.

Penn. R. R.



Above: Alcohol Broilers Instead of Coal Ranges
Left: One End of Café Car, Showing Tables in Place

Four Years *in the* NAVY



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INTERNATIONAL
NEWS SERVICE

PART I THE SIX MONTHS PRELIMINARY TRAINING

BY LOUIS E. BROWNE

THE Navy's authorized strength is 51,500 enlisted men and 3,542 commissioned officers. The service now is less than 1,000 enlisted men short. Out of 12,500 men discharged each year, 6,000 reenlist. A sailor, once enlisted, must serve four years unless retired for physical injuries received in line of duty or by purchasing a discharge under certain conditions.

Recruits are taken at navy yards, recruiting stations, and on big ships. Recruiting stations are maintained at New York, Chicago, Boston, Philadelphia, Baltimore, Pittsburgh, Buffalo, Erie, Cincinnati, Indianapolis, Cleveland, St. Louis, Minneapolis, Chattanooga, Nashville, New Orleans, Omaha, Dallas, Detroit, Denver, Los Angeles, and Kansas City. Substations are maintained at smaller cities.

No man will be accepted unless he is between 17 and 30 years old, and can prove he is a citizen of the United States and of good moral character, of which he must give references. He must also give a history of his life. Experienced naval officers explain the hardships of the service so that the recruit may weigh the advantages and drawbacks before enlisting. A naval surgeon examines the applicant, who must be at least five feet two inches tall, weigh in proportion to his height, and be physically sound. The recruit must be able to read and write. The government pays only actual traveling

expenses to the training stations after acceptance.

The recruit, after enlistment known as an apprentice seaman, is sent immediately to one of the great training schools at Great Lakes, Ill., Newport, Norfolk, or San Francisco. He gets an outfit of clothing consisting of uniforms, shoes, rubber boots, underclothes, overcoat, and sweater, valued at about \$60. Seasoned petty officers give the recruit his first lesson in keeping things "ship-shape." The seaman learns that a well-folded garment is as neatly pressed as though done with a flatiron. He is given a ditty bag which is his trunk while in the service. He is taught the mystery of swinging and lashing a hammock—the sailorman's only bed.

From the first day he enters the service it is impressed upon the apprentice that one thing demanded of him above all others is cleanliness.

The course lasts six months, and is substantially the same at all the schools. The apprentice spends much of his time in the great drill halls, where he learns to heave the lead, coil down gear, make knots, and read the log. In summer he is taught to handle small boats. Each training station has a huge tank where trained instructors see to it that every apprentice can swim before he leaves the school. From "reveille," at 5:30 A. M., until "taps," at 9:30 o'clock at night, his time is

mapped out for him. If he has not already discovered it, the apprentice soon finds that the navy is no place for a lazy man. Before breakfast, at 7:30 o'clock, the man must roll up and stow his hammock, clean out his quarters, and prepare himself for a rigid inspection. Up to 4:30 in the afternoon, when until supper at 6:00, he may spend the time as he pleases, the drills follow closely upon one another, pausing for a brief half hour at noon for lunch. Semaphore, wigwag, and Morse systems of signaling are taught him; he spends hours on the rifle range; he has infantry and field-artillery drills; and once a day he is called for the Swedish movements. In the evening the apprentice attends lectures and recitations in the elementary subjects of grammar, arithmetic, spelling, and geography.

In summer apprentices go on short cruises to learn about hoisting and lowering small boats, anchoring, getting under way, and, most of all, to make themselves at home on shipboard. All equipment for training schools' football, baseball, and other teams, is furnished by Uncle Sam.

The first promotion is long remembered. When advanced to the rank of apprentice petty officer he is vested with considerable authority over his fellow apprentices, which he must cast aside when he goes to sea. This rating brings an increase of from one to three dollars per month in the pay of \$17.60 and keep. There are well-stocked libraries at all of the training schools. Old petty officers who saw service in the "wooden navy" give advice to the youngsters, and because they have been through the mill themselves, are especially fitted to warn their charges what the pitfalls are. When graduated, apprentices are sent aboard the battleships. Destroyers, submarines, and cruisers are manned by experienced men and "short-timers."

Applicants for electrical work must be electricians by trade and must have a thorough knowledge of dynamos, motors, and all methods of wiring. Morse

operators can enlist for wireless work exclusively. None will be accepted who is not between the ages of 18 and 25 years and who cannot read, write, and understand elementary arithmetic. These recruits are sent to one of the training schools at New York or San Francisco. They learn to make all parts of dynamos and motors; to wire a battleship, and must study telephones until they know as much about them as the repair man for a telephone company.

Leave of absence is granted after the six months' course is completed.

Uncle Sam trains clerks, musicians, and nurses. Musicians' classes are maintained at Norfolk and San Francisco; yeomen are taught at Newport and San Francisco. Yeomen must have a knowledge of bookkeeping and typewriting. They are taught correspondence and accounting. Hospital apprentices—naval nurses—after leaving the training schools, are sent to sea for one year. Then they go to naval hospitals for instruction in practical pharmacy and chemistry, ward work, bandaging, and to attend tri-weekly lectures on elementary materia medica, anatomy, and physiology.

The 6,000 yearly graduates of the training schools go aboard ship full of anticipation of advancement. They enter one of the branches of seamen, electricians, engineers, clerks, musicians, nurses, stewards, or artificers. Apprentices may become ordinary seamen at \$20.90 per month and keep. If the enlisted man takes advantage of his opportunities, promotions follow about a year apart—seaman at \$26.40; coxswain at \$33; boatswain's mate, second class, \$38.50; boatswain's mate, first class, \$44. Coal passers who enter the service from the training schools at \$24.30 become second-class firemen at \$33; first-class firemen at \$38.50; oilers at \$40.70; water tenders at \$44; chief water tenders at \$55 and \$77. All chief petty officers, when permanently appointed, receive \$77 per month. The pay is substantially the same for enlisted men in all other branches of the navy.

HOW THE RECRUIT GETS INTO THE SERVICE



The Young Man Having become interested through Reading the Poster, Goes to the Recruiting Station, Files an Application, and is Given a Preliminary Examination. He is Then Sent to a Training Station, Where He is Given a More Rigid Examination; if He Passes This He is Admitted as an Apprentice Seaman

A Corner of the Naval Training Station at Great Lakes, Illinois



The Naval Training Station at Newport, Rhode Island

FIRST DAY AT THE NAVAL TRAINING STATION



Typical Group of Recruits



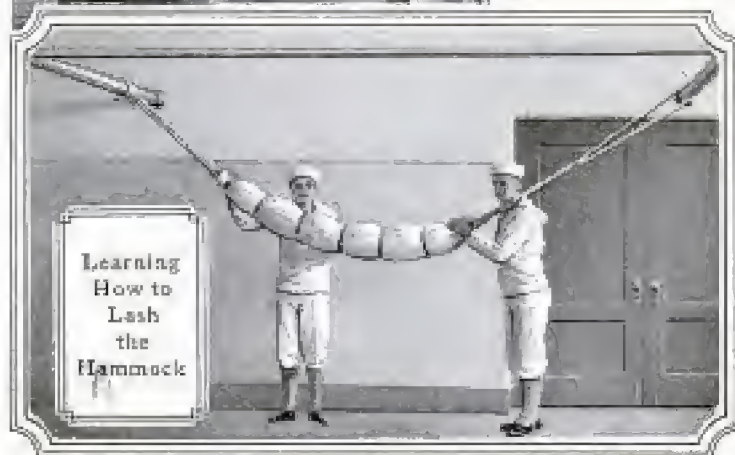
Above: Recruits Entering Mess Hall for First Time at End of Line of Apprentice Seamen



The First Meal is Eaten at a Table Set Apart for the Recruits, Left: Strapping Clothing and Bedding with the Name of Recruit to Whom They are to be Issued



Below: How the Recruits Look at the End of the First Day, When They are Regarded as Full-Fledged Apprentice Seamen



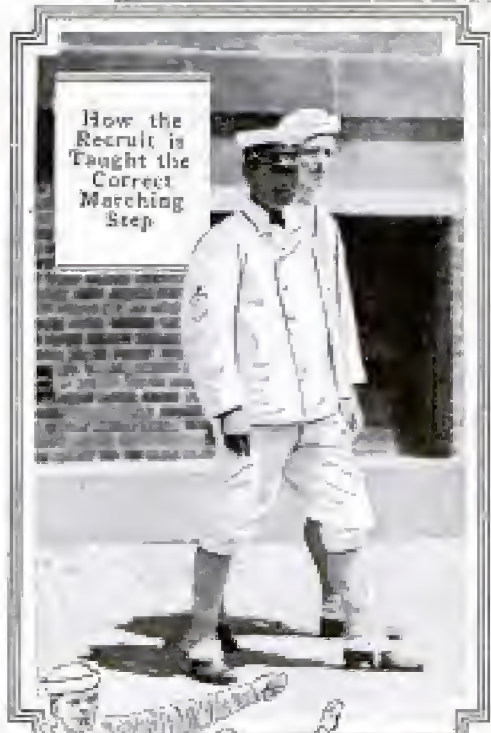
Learning How to Lash the Hammock



INSTRUCTION IN SALUTING AND SIGNALING



Squad of Apprentice Seamen Receiving Instruction in the Code for Signaling with Flags, or Wigwagging

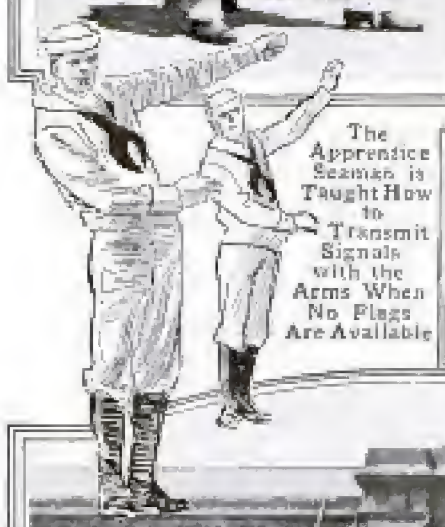


How the Recruit is Taught the Correct Marching Step

The Picture at the Right Shows the Kind of Flag Used in Wigwagging



The Salute, Shows Above, Is One of the First Things Taught the Recruit



The Apprentice Seaman is Taught How to Transmit Signals with the Arms When No Flags Are Available

The Picture Below Shows a Squad of Apprentice Seamen Engaged in Land Drill



Signaling with the Semaphore

THE RECRUITS ARE TRANSFORMED INTO SEAMEN



A Letter from Home

Above:
A Drill in
the
"Leaning
Rest," a
Setting-Up
Exercise
Used
Both in
the Navy
and
in the
Army



One of the
Amuse-
ments
Provided
for
Apprentice
Seamen



The Rifle
Range at
Newport,
Rhode
Island.
Acquiring
Correct
Move-
ments for
Swimming



BY CONSTANT DRILL AND PHYSICAL EXERCISE

View of the Range at Great Lakes Naval Training Station with Apprentice Seamen Engaged in Target Practice



On This Range Recording Target, is Placed near the Firing Station, and on It the Hits are Recorded without the Aid of Score Markers

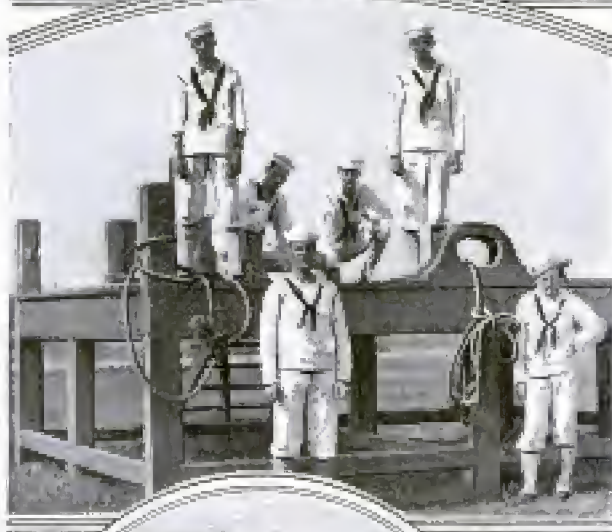


The Picture Below Shows Apprentice Seamen at Drill with a Landing Gun



A
Gymnasium
Class Taking Swedish-
Movement Exercise: This Exer-
cise Comes at End of Gymnasium
Course and can be Undertaken
Only by Highly
Trained
Men

AND DRILLED IN THE DUTIES OF SEAMANSHIP

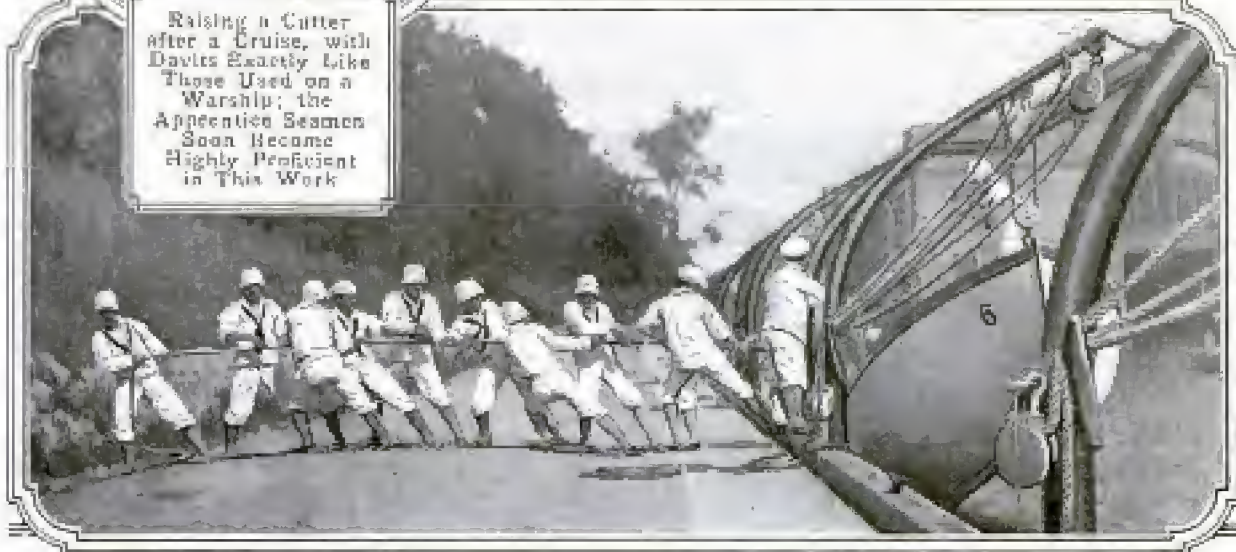


Above:
Land Drill
in the
Work of
Mooring
a Ship

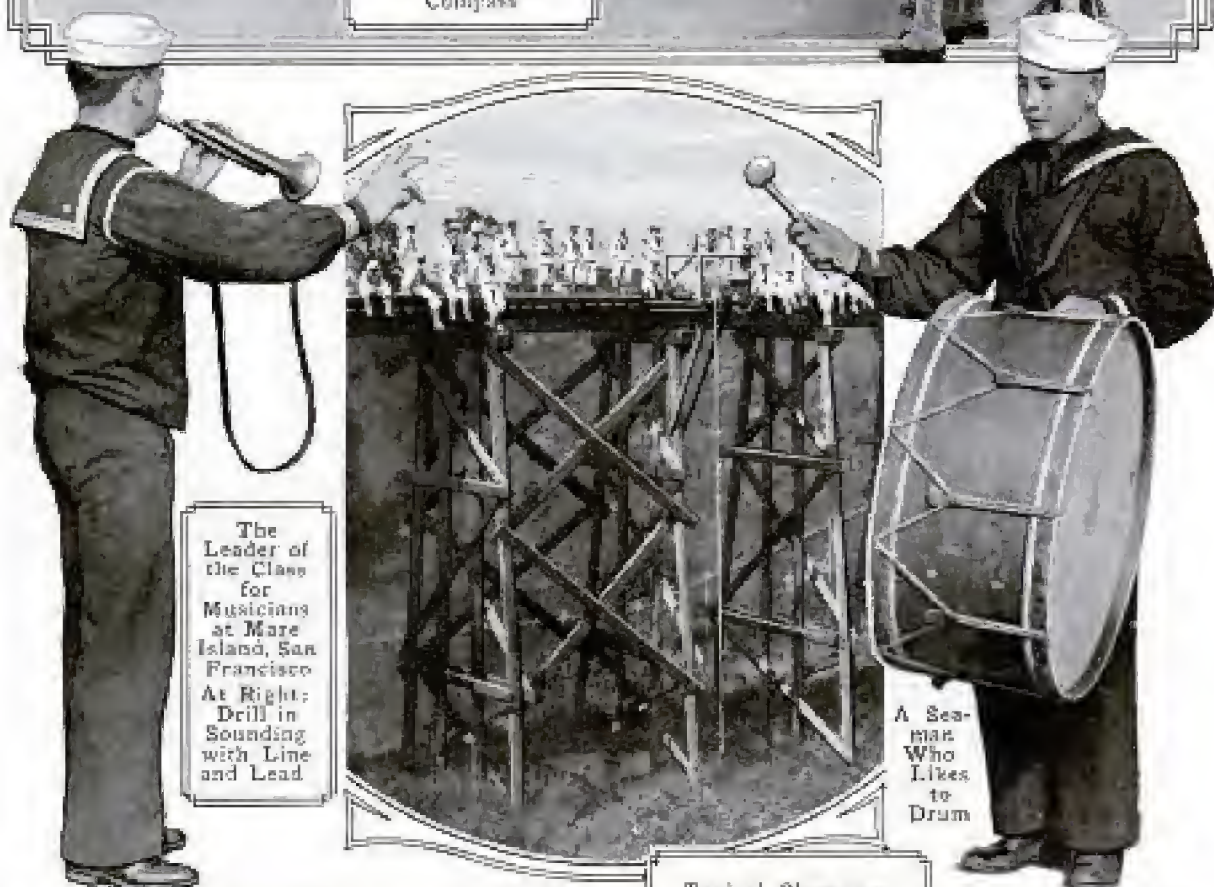


Acquiring
Skill in
Handling
a Cutter

Raising a Cutter
after a Cruise, with
Devices Exactly Like
Those Used on a
Warship; the
Apprentice Seamen
Soon Became
Highly Proficient
in This Work



CLASS WORK AT THE NAVAL TRAINING STATION



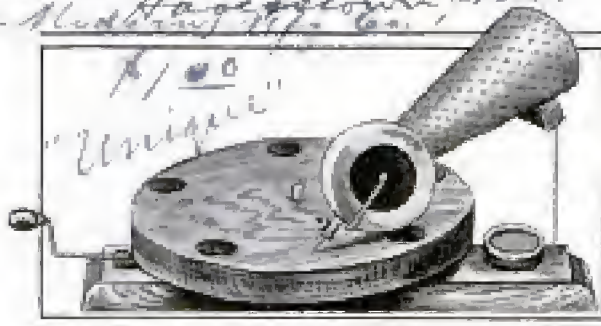
177
**NORTHEASTERN RAINSTORMS
WHICH COME FROM WEST**
Science Spectator

It is a curious fact that what is generally known in some of the eastern states as a northeastern storm, is in reality of quite a contrary origin. Because a strong wind which frequently carries heavy rain is apparently driven from a northeasterly direction, it is popularly assumed, in this specific area, that the storm originates somewhere in a northeastern zone, while in truth its real source is in the west or southwest. The explanation is that such a disturbance is merely an indraft of a barometric depression in the opposite direction. The storm is known as a "flareback" and is one of the conditions which causes a weather forecaster difficulty.

167
**CHEAP TALKING MACHINE
OPERATED BY CRANK**

Application for patent has been made by a Maryland inventor who has developed a talking machine that is operated by hand power instead of a spring motor. It is built to play disk records and is substantially made of

*Inventor: H. W. Fennell,
714 1/2 N. Madison St., Hagerstown, Md.*



The Turntable is Revolved by the Crank at the Rear oak. The device costs less than an ordinary record, although it is not produced as a toy.

*Unique Co.
Hagerstown
Md.*

**MOTOR TRUCK HAULS ENGINE
92 BETWEEN CITIES**

In transporting a donkey engine from Los Angeles to San Pedro, Cal.,



Motor Truck Pulling an 18-Ton Engine between Los Angeles and San Pedro, California

a distance of approximately 25 miles, a motor tractor was recently called upon to make the haul across country. The locomotive, which is used for construction work and weighs about 18 tons, was blocked up on an underslung wagon coupled to a trailer at the rear of the truck. The trip was made without difficulty, which was partly due to the excellent condition of the road over which the haul was made.

150
**COLOR PARTS USED IN
ORCHESTRAL MUSIC**

Degrees of emotion from placid contentment to intense manifestations are vividly expressed by color parts used in connection with orchestral music now produced in some of the greatest concert halls of the world. The mechanism and operation of the color organ was described in the June number of Popular Mechanics Magazine, and the cover design of this issue depicts a color phase as it appears to the spectator-listener. That colors have decided influence on the nervous system has long been established, but their adaptation to the expression of musical themes has only recently been worked out.

*See Card 9731 June '15-336
" June '12-320
" Book - "Color Music"
Copyrighted material*

175

MECHANIC ADVERTISES SELF WHILE SEEKING WORK

During a period at Chicago when many workmen were out of employ-

ment, a mechanic, who has both a sense of humor and an appreciation of the drawing force of right advertising, adopted quite a curious method of letting the public know that his services were available. He made a rough, but clearly legible, sign which he fixed to the steering head of his bicycle. Thus equipped he rode along and



succeeded in obtaining several jobs.

9839

LINE-BUCKING APPARATUS FOR FOOTBALL MEN

For hardening his men and putting them in condition for scrimmage work, the coach of the Carlisle football team has devised a work-out apparatus which not only serves to strengthen the shoulder, back, and thigh muscles

of a player, but also tends to develop and drill him for line positions. It is made of heavy timbers, has a sledlike base, and on the front side is provided with seven heavily padded upright planks. The weight of the device amounts to a little more than 1,000 lb., or approximately the equivalent of that of seven average players. When the apparatus is in use the padded planks serve as opponents for the linemen positioned before them. Obviously, at a signal, the players buck the framework as they would a line, each setting a shoulder against one of the padded posts and exerting his strength to push the heavy apparatus forward. The friction in this practically corresponds to the holding power of seven men.

9563 Geo. H. Cooper (Inventor)

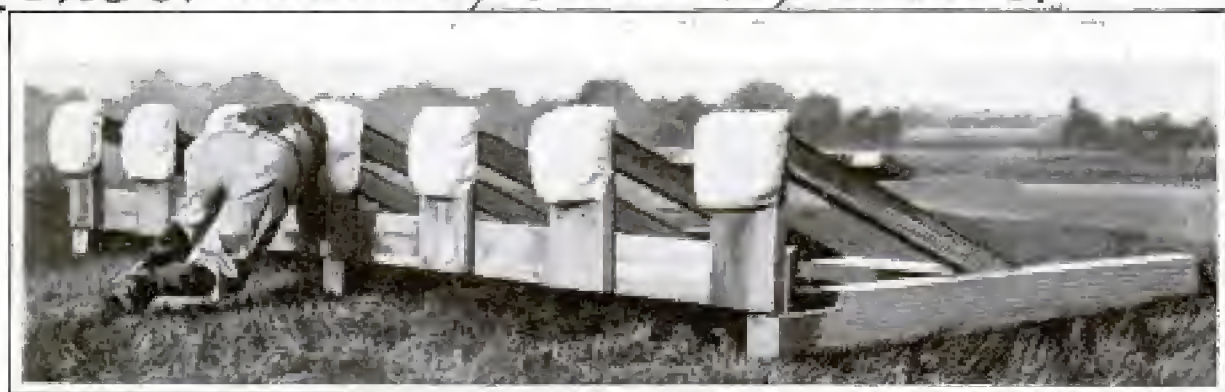
CHESS GAME AS ATTRACTION FOR THEATERGOERS

Ellendale, N. D.

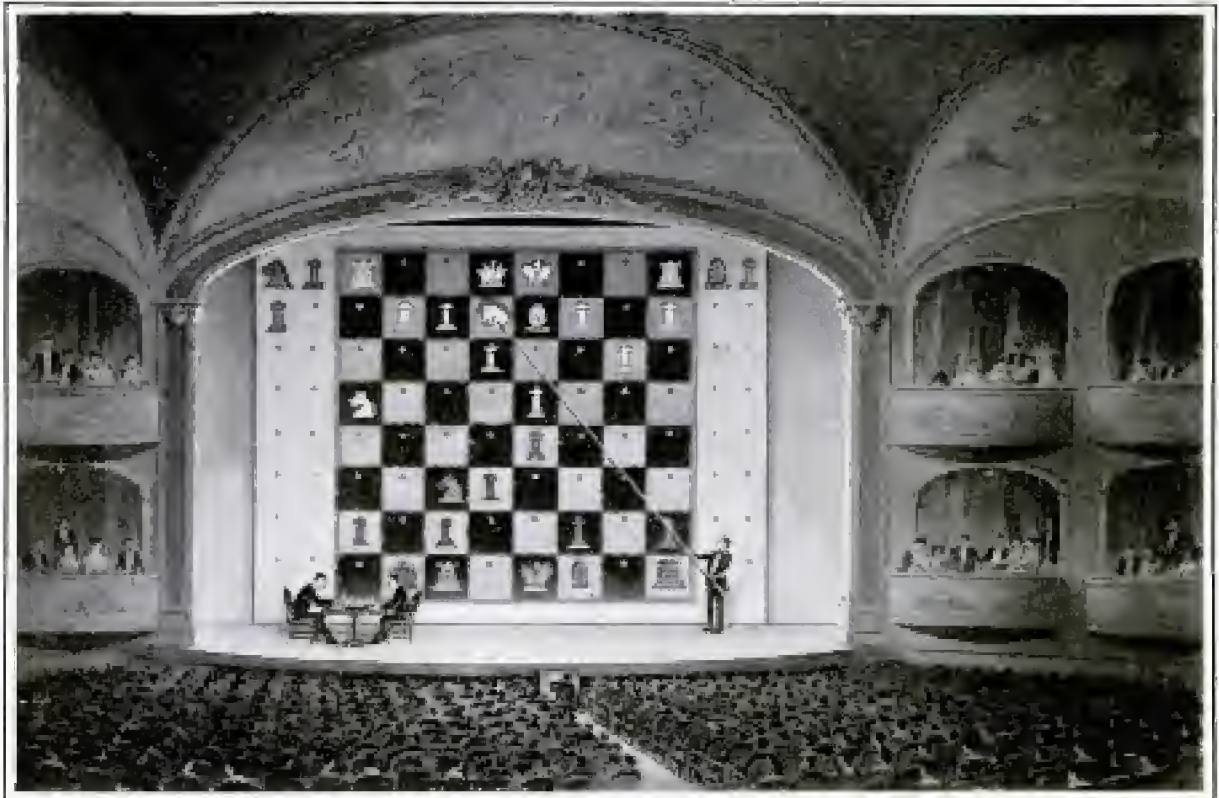
In order to make it possible for a large number of persons to witness a chess or checker contest, a North Dakota inventor has devised a flexible game board which may be made in any necessary size and suspended on a wall in full view of an audience. It is intended for parlor, hall, or theater purposes.

The board is made of a material which allows it to be wound on a large roller like a curtain. Small holes in each of the various squares provide a means of suspending the chess or checker men, which are supplied with hooks, in their proper positions. When the board is an extremely large one; making it impossible for a person to

C. McC. Stewart, Carlisle, Penna.



This Heavy Apparatus is Used in Conditioning the Men on the Carlisle Football Squad



By Means of This Game Board a Large Audience Is Able to Watch the Progress of a Chess Game and Enjoy It as Thoroughly as if Enabled to Look over the Shoulders of the Players

reach to the top of it, or to make the changes without obstructing the view of the audience, a specially designed rod is used in moving the men during the course of a game. These latter members are made of flat pieces of wood or other suitable material, outlined and decorated to represent the different characters, such as king, queen, bishop, and knight.

In a theater, for instance, a board large enough to extend across the stage would be employed. The players would use an ordinary board, while their various moves would be recorded on the game board in full view of the audience.

WHAT IT COSTS TO START 226 AND STOP TRAINS

Estimates of the expense of bringing a 2,000-ton freight train, traveling at the rate of 25 miles an hour, to a full stop and then regaining a like speed, were recently made on a southern railway. Placing the cost of fuel at \$3 a ton, the expense is 61 cents. Of this

amount approximately half is fuel cost; a third, depreciation in the brakes and auxiliary equipment, and a sixth, time lost by the crew.

NEW KNIFE BLADE WITH 9847 GUARDED POINT

A new knife blade recently patented by a California inventor and intended for such work as trimming nails is provided with a rounded, dull end that projects beyond the edge and acts as a guard by taking the place of the point. With an ordinary blade there is always the possibility that the point will cut into the flesh, and the purpose of the invention is to eliminate this danger.



*Marine Journal (6/26/15) Edw. T. A. Beecher,
Taft, Calif.*

#6. E. Drayer
340 1801 E. 93rd St.
Cleveland, O.

POPULAR MECHANICS

LEAK IN COFFERDAM CLOSED 9830 BY FREEZING

After about \$10,000 had been spent in a vain attempt to stop a leak in the sheet piling that formed a cofferdam

were driven through the mud to the seat of the trouble. The brine was kept at a temperature of 10° F., and was circulated at a speed of 30 ft. a minute. At the end of five days a block of ice and frozen mud, 2 ft. thick, 4 ft. long, and 16 ft. high, that effectually closed the leak, had been formed. The refrigerator plant was kept in operation until the concrete had



View of Cofferdam at Cleveland, Ohio, in Which a Leak was Successfully Stopped by Freezing

around the excavation for a bridge pier at Cleveland, Ohio, the leak was finally closed at a total cost of about \$1,600 by freezing the mud and water. The footings of the pier are 50 ft. below the surface of the river, and excavation had proceeded nearly to that depth when the steel-sheet piling was bulged inward by the pressure of the mud and water. This resulted in a leak that quickly put a stop to the work. After other methods of closing the leak had been tried and proved unsuccessful, a refrigerating plant was installed and eight pipes for circulating the brine



How the Steel-Sheet Piling was Bulged Inward under the Pressure of the Mud and Water

been built to a level above that of the leak.

9934 PROJECTING RAILWAYS THROUGH NEW COUNTRY

Francis J. Dierke 18 Hanover Blk., Bellamy St., Edmonton, Alta.

Pushing a railroad through a new country where there are no adjacent lines and all hauls are long, is quite a different matter from projecting a road across settled districts where provision and supply depots are within easy access and communication is a matter of a few hours instead of days. It is the former condition which is being encountered by engineers engaged in

breaking through the wildernesses and across the frontier country of northern Canadian provinces.

In some sections of Alberta there has been quite rapid work accomplished in railway construction. This has been particularly true in the prairie districts where, during the summer months when the days are long, double shifts of men have been worked. In

these places it has not been uncommon for a line to be carried ahead more or less consistently at a rate of slightly more than two miles a day, a speed which of course is altogether impossible in many localities. This does not mean the aggregate of work done at various points along an extended right of way, however, but on the contrary, track projected immediately ahead of a given point over new ground. For in most cases it has been necessary to bring supplies up from the rear over the fresh track as it has been constructed.

For the most part the tracks are first projected and then attention is given to providing an adequate roadbed for them. So in doing the work through flat sections a number of graders precede the track-laying machine by only a short distance. As a grader is moved ahead, the sod and earth turned up by it is carried on an endless belt and loaded into wagons driving alongside. The track layer, an apparatus which carries ties and rails ahead from cars

at the rear and lays them, follows close upon the heels of the grading gangs. The trackmen bring up the rear, spiking the rails to the ties, gauging the tracks and straightening them sufficiently to allow the passage of the supply trains.

It is reported that the Russian war department has ordered masks for the army horses as a protection against poisonous gases.



As the Grader Proceeds, the Sod and Dirt

is Conveyed into Wagons Driven of It at the Right



Here a Track Layer is Engaged in Pushing Rails Ahead along the Newly Placed Ties Extending in Advance of It



Gauging a Freshly Laid Track Projected across a Stretch of Open, Flat Country Where Grading was Dispensed With

342
9804

POPULAR MECHANICS

9986

WINDSHIELD NEW FEATURE FOR RACING CAR

Quite an interesting departure from the more or less established rules governing the designing of motor cars for



Racing Car Provided with a Windshield for the Protection of Its Driver

racing purposes has recently been introduced in a machine built particularly for the Indianapolis speed contest. The car is provided with a low, back-sloping windshield which protects its occupants from the strong air force encountered in high-speed driving. It extends only a few inches above the hood in a modified streamline, so that the resistance offered by it amounts to very little, if any, more than that customarily caused by the wind striking the bodies of the pilot and his mechanic. Experiments have tended to indicate the possibility of a driver enduring a 1,000-mile run with this protection.

Exports of American agricultural implements during the fiscal year ended June 30, 1915, totaled approximately \$10,000,000, as against a yearly average of more than \$29,000,000 during the preceding decade.

INTENSIVE INSTRUCTION FOR

WAGE EARNERS

U. S. Dept. of Labor Bull. 159
92 pp. 10¢
Supp. of
Dress.

Experience in a number of different trade and industrial schools has shown, according to a survey of the Department of Labor, that short

unit courses of instruction embracing specific subjects and presenting them in a limited number of lessons, is the most effective way of assisting a large class of wage earners to increase their skill and earning power. It is an intensive form of instruction meant merely to serve a specific need of a particular group of persons, each course being complete in itself, dealing with simply one phase of a trade and including only things found to have practical value in that trade. Unnecessary preparatory work is eliminated. The advantage of the plan is that in a course of 10

lessons, for instance, a school can ordinarily hold a pupil until instruction on that subject has been completed. He is then also more disposed to take another short course of a different nature, than if the previous instruction had been spread over a period of several weeks or months.

PAGEANT STAGE SCREENED BY CURTAIN OF STEAM

At the Lexington, Mass., pageant, held recently in commemoration of the centennial of peace with Great Britain, a steam curtain was employed to screen the outdoor stage from the audience. This novel plan was adopted because of the impracticability of using a cloth curtain.

A perforated steampipe was laid for a distance of some 1,500 feet across the front of the stage. Rows of colored electric lamps were placed parallel with



This Shows a Section of the Vapor Curtain in Use at the Lexington Centennial Celebration

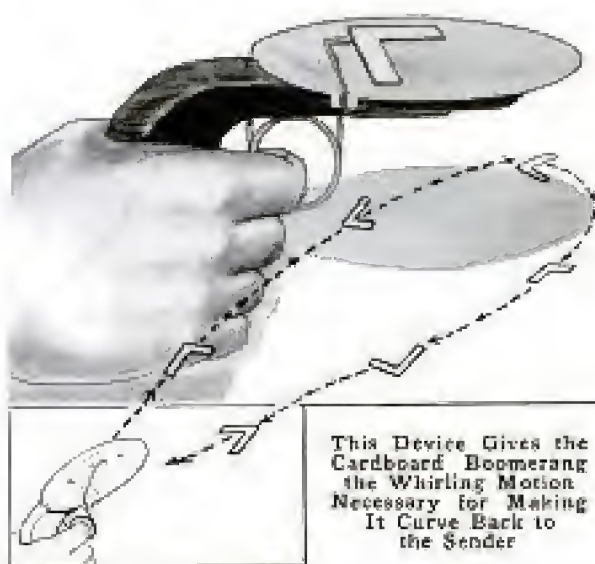
it. When steam was forced into the pipe and in turn allowed to escape from it through the small holes, clouds of vapor lifted from the field, forming a dense curtain of fog. By lighting the colored lamps, the rays were reflected with very pleasing effects. This means was used to shield the performers before the pageant started and also during the intervals when the scenes were changed.

9499

NEW TOY FOR SHOOTING CARDBOARD BOOMERANG

A toy recently placed on the market is designed to throw a cardboard boomerang in such a way that it curves back to the sender just as the original missile bearing this name curved back, in case it missed its mark, to the Australian native throwing it. This device consists of a disk mounted on a handle that is shaped somewhat like a pistol. Working over the face of the disk is a tongue spring that is operated in conjunction with a trigger projecting up through the disk. In using, the spring is drawn back until it is caught and

held by the trigger, and the boomerang is laid flat over outlines marked on the disk, with one edge touching the end of the spring. When the trigger is pulled the spring is released, and the



This Device Gives the Cardboard Boomerang the Whirling Motion Necessary for Making It Curve Back to the Sender

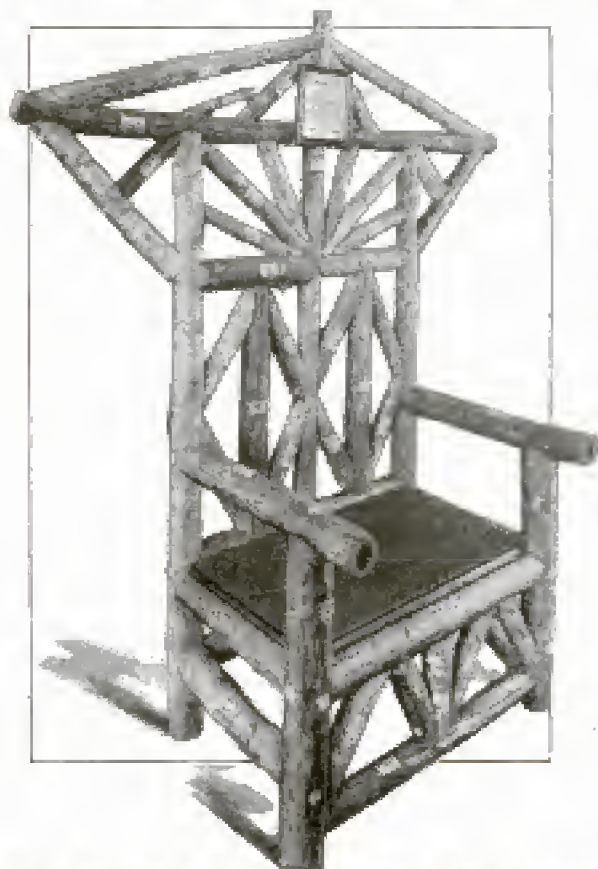
boomerang is shot forward with the whirling motion necessary for making it curve back to the sender.

Inventor: C. P. Hanson, Kiles, Mich.

Mrs. Henry Goldwater,
 of Mrs. W. D. Swan, Empire Court
 314
 62 POPULAR MECHANICS San Francisco,
 # 224

WOODS REPRESENT STATES IN NOVEL CHAIR

In the New Jersey building at the Panama-Pacific Exposition there is a rustic chair made of bark-covered



Each Piece of Wood Used in Building This Chair was Supplied by the Governor of a Different State

pieces of wood representative of the various states of the Union. It is a high-backed seat and known as the governors' chair, for each of the sticks used in its construction was furnished by a different state executive. In all cases the wood is typical of the state supplying it, California, for instance, being represented by redwood, Oregon by Oregon fir, and other states by maple, hickory, walnut, cypress, gum, myrtle, and other woods. Silver plates engraved with the governor's name, his state, and the name of the respective piece of wood contributed by him, are fixed to each of the several members making up the chair.

The first rail on the railroad to extend from Palm Beach, Fla., into the Everglades was laid June 17, 1915.

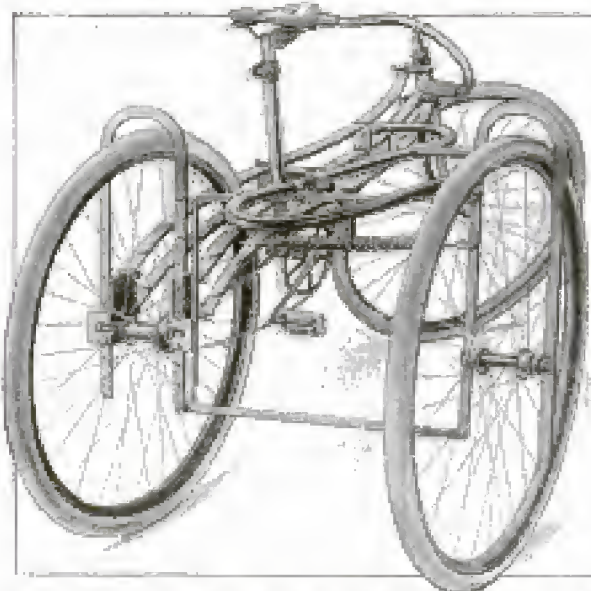
CUTTING OF NATIVE TIMBER GROWS IN PHILIPPINES

Dept. of Commerce

Prospects for future demands for American lumber in the Philippines are not encouraging, according to the Bureau of Foreign and Domestic Commerce, which is conducting an investigation of the lumber trade in the Far East. At the present time Pacific Coast mills supply practically all the lumber shipped to Manila, and for the 12 months ended June 30, 1914, this business amounted to approximately \$500,000. A sharp competition is now being experienced with native woods, and it is believed that this will eventually become much keener.

BICYCLE WITH NOVEL TYPE 8783 OF FRAME

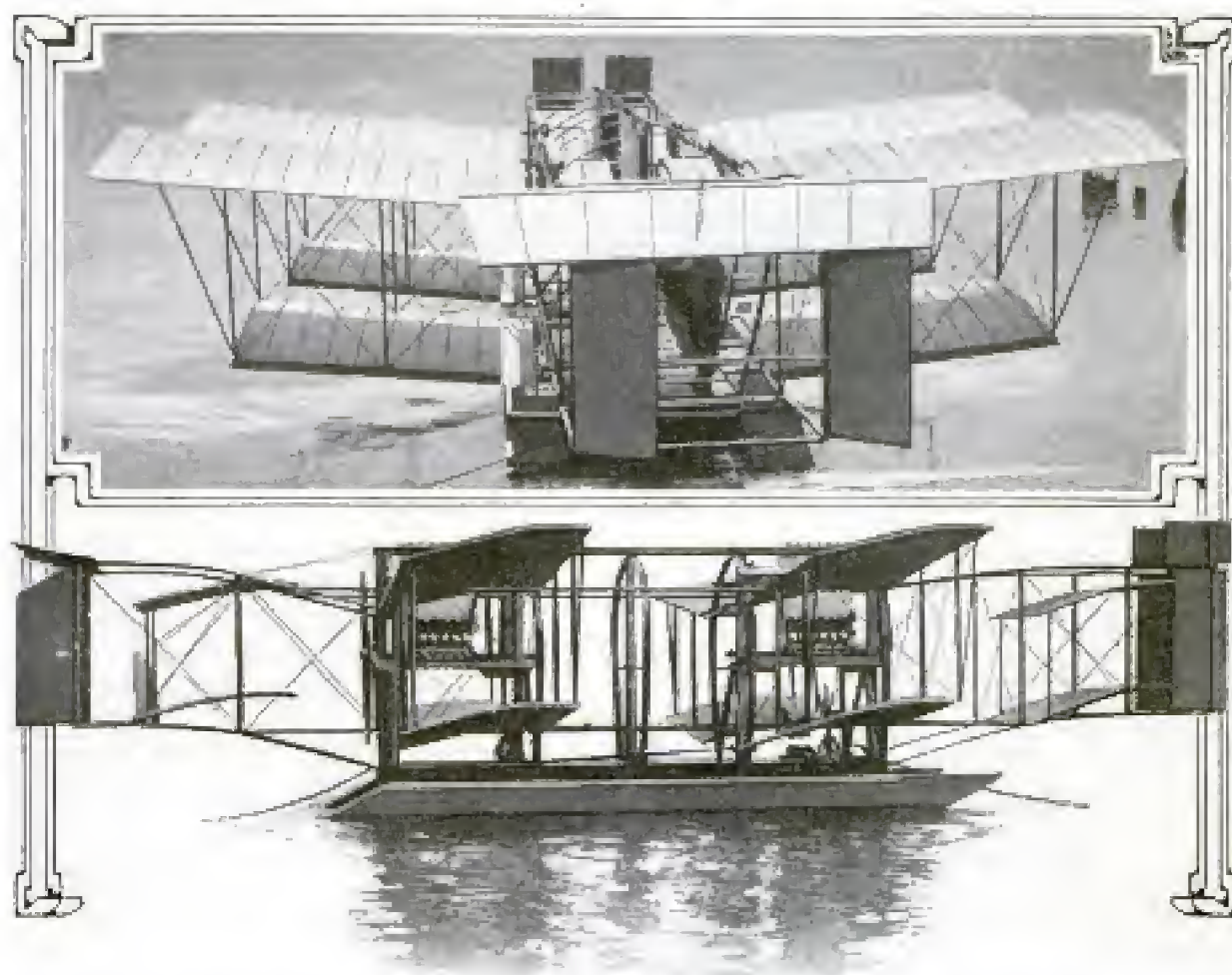
A bicycle that is radically different from the usual lines of construction has been devised by a California inventor. In place of the familiar diamond-shaped frame, the front and back wheels are connected by two sets of parallel, pivoted springs. These springs are rigidly connected to act as a unit in their elastic movement. Another novel feature is a sidecar attached by



Bicycle with Spring Frame: The Sidecar is So Attached That It Tilts with the Bicycle in Making a Turn

articulated members which permit it to tilt with the bicycle in making a turn.

Inventor:
 Geo. S. Buckland
 4180 Army St.
 San Francisco
 Pat. 10/27/14



Top View: The Manner in Which the Superstructure, Which Braces the Craft and Supports the Motors, Divides the Wings; Lower View: The Position of the Engines and the Fore-and-Aft System of Elevators and Rudders

178 LARGE FLYING BOAT TESTED ON POTOMAC RIVER

Experiments have been conducted at Alexandria, Va., with a flying boat, lately developed by a Massachusetts inventor. The craft, which is one of the largest in this country, has several more or less distinctive features, although its general design is not altogether new.

It is built on two long, sledlike pontoons and is equipped with a pair of six-cylinder horizontal motors that develop approximately 136 horsepower. While the hull has the appearance of being surmounted by tandem biplanes faced head on, this is not exactly the case. The superstructure divides the wings so that the craft is virtually supported in the air by four biplanes. Elevating planes and rudders are carried on outriggers extending fore and aft of

the boat. Four gasoline tanks mounted above the engines hold 50 gal. of fuel, while it is possible to carry a store of several barrels in auxiliary tanks contained in the pontoons.

The machine is driven both by tractor and pusher propellers. It weighs about 2,300 pounds and is reported as capable of carrying 20 passengers. It is credited with being able to make a speed of 60 miles an hour.

8888

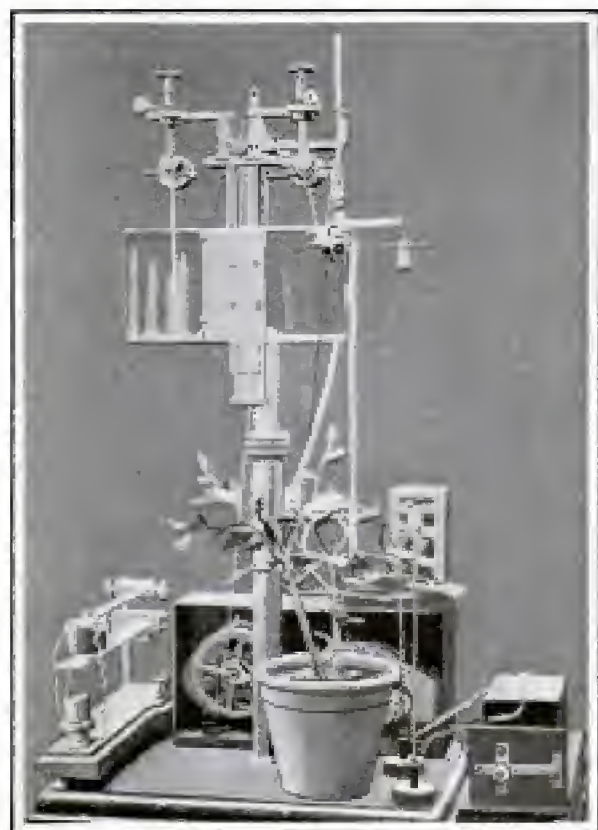
EXPERIMENTS SHOW NERVOUS PROCESSES IN PLANTS

Experiments carried out by a Hindu investigator apparently prove that plants respond to stimuli of every kind, and feel pain when injured, in exactly the same manner as animals, and so conclusive do these experiments appear to be that they are likely to have a revolutionary effect on scientific think-

8888 Inventor:

Dr. Jagat Chandra Bose
 a Hindu Plant Physiologist

ing on this subject. The investigator is said to have proved by his experiments that anesthetics and stimulants, cold and heat, starvation and repletion, poi-



The "Resonant Recorder," an Instrument of Extreme Delicacy Used in Measuring the Responses of Plants to Artificial Stimuli

sons and antidotes, produce identical effects on plants and animals. He goes further by announcing that the rhythmic pulsations of the plant are similar to those of the human heart, and that these pulsations keep up spontaneously and incessantly until the time of its death, when, with a spasm like that of a dying man, it breathes its last. Like a human being, a plant has its exalted and depressed periods, its periods of sleep and of wakeful activity. When in an excited state it will respond effusively to a feeble stimulus, but when it is depressed the response is feeble even when the stimulus is strong. It can be made unsteady in its responses by drunkenness or drowsy with narcotics. It can be benumbed with cold and expanded into activity with heat. Some plants are so sensitive that they respond instantly to the momentary lessening of the sunlight by a pass-

ing cloud. It has also been found that the sensitiveness of a plant, like that of a human being, can be blunted by over-feeding or coddling, as well as by starvation.

In making these experiments the investigator used a number of instruments of extreme delicacy, among them being the "resonant recorder" shown in the illustration. With this instrument it is possible to apply stimulus to the plant and measure its response with the greatest accuracy. The instrument makes its record by means of a musical string that carries a minute pointer. As the string vibrates under the impulses received from the plant, the pointer makes a series of dots on a sensitized plate, which reveal to the investigator the character and speed of the response made by the plant to artificial stimulus. So sensitive is the adjustment that the instrument is capable of measuring time intervals as short as the thousandth part of a beat of the human heart.

23

TRAIL OF LIGHT MARKS COURSE OF AEROPLANE

To enable the spectators to follow the course of his night flight over the exposition grounds at San Francisco one of the best-known of trick fliers resorted to a novel means of illumination. Several lights were carried on the machine, but the novel feature was a non-explosive device, mounted on the back of the machine, that threw out a continuous trail of white fireworks. Owing to the fact that the aeroplane itself could not be seen and that the lights at any point in the course were visible only for an instant, it was possible to make a very good photograph of the entire flight by a single time exposure of the negative. In this photograph the course of the flight is shown by one or more streaks of light, as shown in the illustration. The horizontal lines show the machine as it ascended to a height for looping the loop, the breaks in the lines being caused by a momentary shutting off of the lights. The



COPYRIGHT BY THE FARMELL VINCENT CO.

San Francisco.

How an Illuminated Aeroplane Looked to the Spectators As It Looped the Loop at Night over the Tower of Jewels at the Panama-Pacific Exposition

irregular vertical streak shows the course of the machine as it looped the loop over the Tower of Jewels. In this line there are five distinct loops. It is estimated that at times during this descent the machine was going at a speed of more than 100 miles an hour.

154

WIND WRECKS JEWELRY SHOP AND SCATTERS DIAMONDS

During a severe windstorm which recently centered its force upon a small Oklahoma town, several thousand dollars' worth of jewelry displayed in a shop window was blown into the street when the front of the store was demolished. A large number of rings and unset stones, as well as other ornaments, were scattered broadcast. Because of the danger of being struck by flying debris, the owner and employees of the store were unable to attempt the recovery of the missing stock until the storm had partly subsided.

*# T H Barrett
202 S. Winnitka St.
Dallas, Tex.*

ANGLEWORMS ARE PRESERVED FOR DRY-SEASON FISHING

Fishworm propagation is the somewhat odd departure of an Indiana boy who is an angler by inclination, but who has no particular desire to waste time needlessly in digging bait. Two 5-gal. earth-filled oyster cans, with per-



Feeding the Stock of Fishworms with Coffee Grounds and Cornmeal

*# Raymond Mason,
Pensacola, Fla.*

forated bottoms, sunk in the ground and covered by a door, constitute the pen. In the spring when the spading of the garden devolved upon him, and when worms were plentiful, he collected his stock. Since that time he has fed them with coffee grounds, corn-meal, and water and has had an abundant supply of fresh bait.

9970 OLD TRAILS FORM ROUTE ACROSS CONTINENT

After four years of coöperative work in various states, the National Old Trails Road extending from the East to the Pacific Coast has been opened. Signposts mark the highway from Washington to San Francisco, and it is stated that the road conditions are such that motorists can make the trip from New York with ease in approximately five weeks, spending the nights at comfortable hotels while en route.

The road is not properly a national one, as Congress has twice failed to designate it as such. It has been promoted by the Daughters of the American Revolution in conjunction with numerous associations and individuals in different sections. National, state, and county assistance has been afforded it, while in many instances city and township organizations have helped in marking and dragging it in specific localities. During the coming

year attention will largely be devoted to its beautification.

The highway follows old colonial and pioneer trails from New England to the West Coast. It offers two different routes to California, one of which extends southwest from Kansas City to Los Angeles by way of Santa Fe; while the other reaches across Kansas, Nebraska, Wyoming, and Idaho, branching at Pocatello and extending to San Francisco on one hand and to Portland, Ore., on the other.

One of the latest monuments to be erected along the highway was unveiled recently at a point north of Hebron, Neb., where the old Oregon Trail is intersected by the Meridian Road extending from Canada to Galveston. It is a granite slab on which is inscribed a brief history of the early route taken by frontiersmen and gold seekers.

9720 SUBMERSIBLE OIL TANKS FOR SUPPLYING SUBMARINES

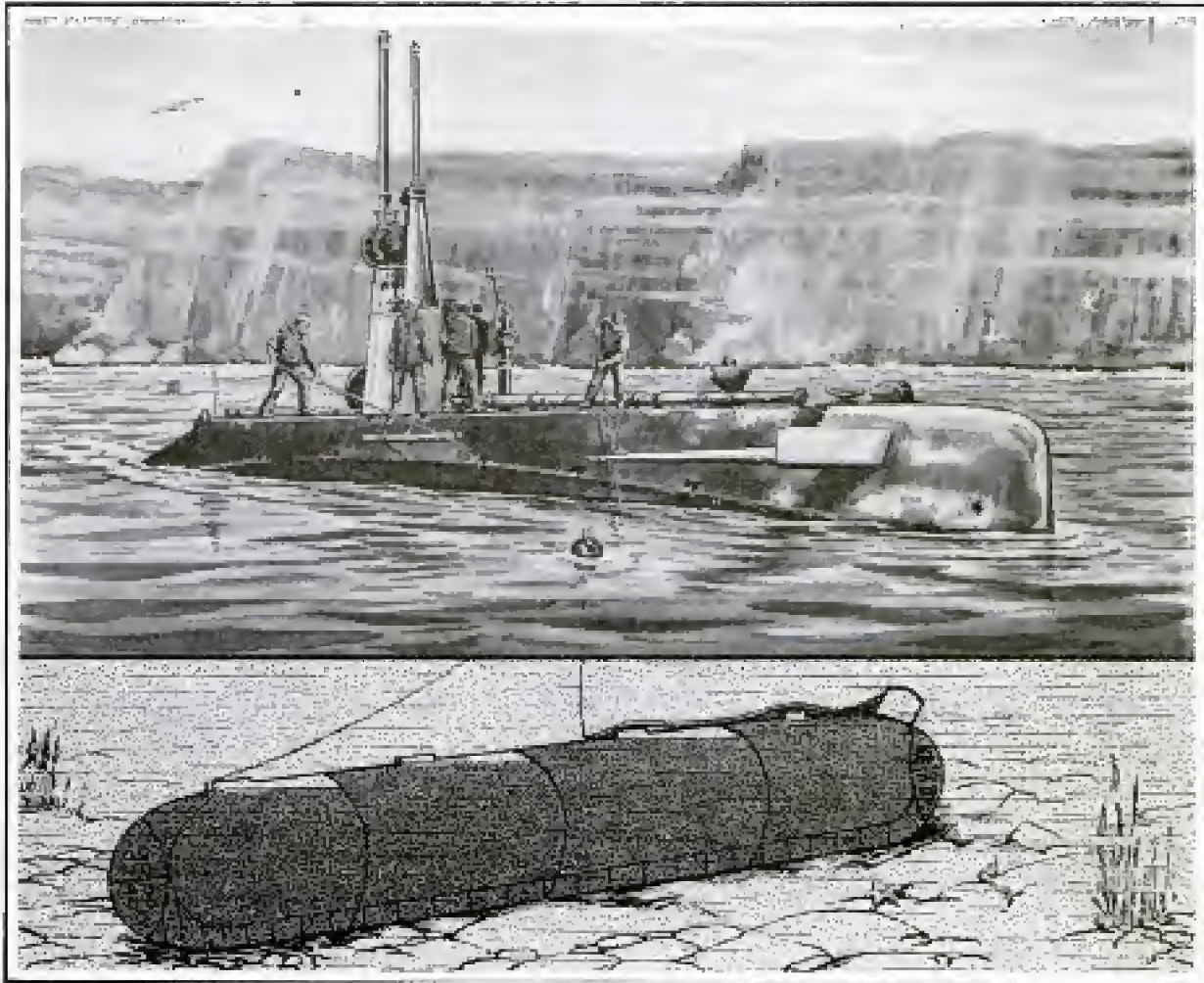
The ability of the German submarines to keep at sea for indefinite periods when hundreds of miles from any German naval base has been one of the surprises of the war. It is now suggested that the Germans may have established secret submarine bases consisting of submersible oil tanks at unfrequented points along the Norwegian



Monument Marking Intersection of Oregon Trail and Meridian Road

Route of the Old Trails Road across the United States

A. E. Hammers, Hebron, Neb. (The Photo Crafts Shop)



The Submersible Oil Tank Sunk to the Bottom and Marked by a Buoy; It is Raised to the Surface by Pumping Air into the Ballast Compartments

coast and among the islands at the west and north of Scotland, and that the enormous supplies of oil required for the operation of these vessels is obtained from this source. This could be accomplished by means of a submersible tank that had already been invented for commercial purposes before the war began. This tank is cylindrical, is 150 ft. long and 30 ft. in diameter, and has an oil capacity of 2,280 tons. It is divided into four or more compartments which can be used for various grades of oil and can be emptied separately or together. Each end of the tank is divided vertically into two compartments, the upper compartment being utilized as a pump house and the lower as a ballast or trimming tank. With these trimming tanks, which can be filled with sea water or emptied by means of electric pumps, the cylinder can be floated or submerged, or can be

made to float at an angle with the pump house at one end above water. An electrical oil pump capable of discharging 100 tons an hour forms part of the equipment. When a submarine or other vessel is to replenish its bunkers it comes alongside, couples its electric cables to the pumps in the valve house and pumps out the required supply of oil, after which the tank is sunk to the depth required for concealment. The same process is followed by a vessel replenishing the supply of oil in the tank. When the tank is to be sunk to the bottom of the anchorage the electric cable and supply pipe are buoyed. The tank is securely anchored in case it is left floating.

¶The total production of explosives in the United States, exclusive of exports, was 225,126 short tons in 1914, and 250,008 short tons in 1913.

Made especially for Hotel Statler, Detroit.
 by The John Widdicombe Co.
 Grand Rapids, Mich.
 NOT³⁵⁰ ON SALE POPULAR MECHANICS
 729

9684 COMBINATION FURNITURE
 MADE FOR NEW HOTEL

In order to save floor space in its guest rooms, the management of a western hotel has had a chiffonier and



Chiffonier and Writing Desk Designed for Hotel Purposes

writing desk combined into one piece of furniture for its particular use. When the desk is closed the appearance given is that of a low, broad chiffonier backed by a glass much the same as if it were a dresser. Apparently it has five drawers, but actually, only four; two above and two below the desk, which is made by utilizing the space that otherwise would be occupied as the third drawer. An adjustable lamp which may be used as a reading light is provided.

¶The total area planted to cigar tobacco in this country in 1915 is 172,400 acres, a slight decrease in comparison with 1914. The area planted to chewing and smoking tobacco, snuff, and export types shows an increase of 9.3 per cent, the total acreage being 1,132,000.

GREAT ITALIAN TRADE OPEN
 TO AMERICAN CAPITAL

Because of conditions brought about by the opening of hostilities with Germany and Austria, America has never had a better opportunity than is now afforded to dominate the coke and iron business in Italy. The demand for metallurgical foundry coke, as well as pig iron, in the Latin country is urgent. In the past the bulk of this trade was held by Germany and Austria, and it is not considered likely that, even though the war should be brought to an abrupt end, trade relations would be reestablished between the enemy countries unless absolute necessity so dictated, according to advices received by the Chamber of Commerce of the United States.

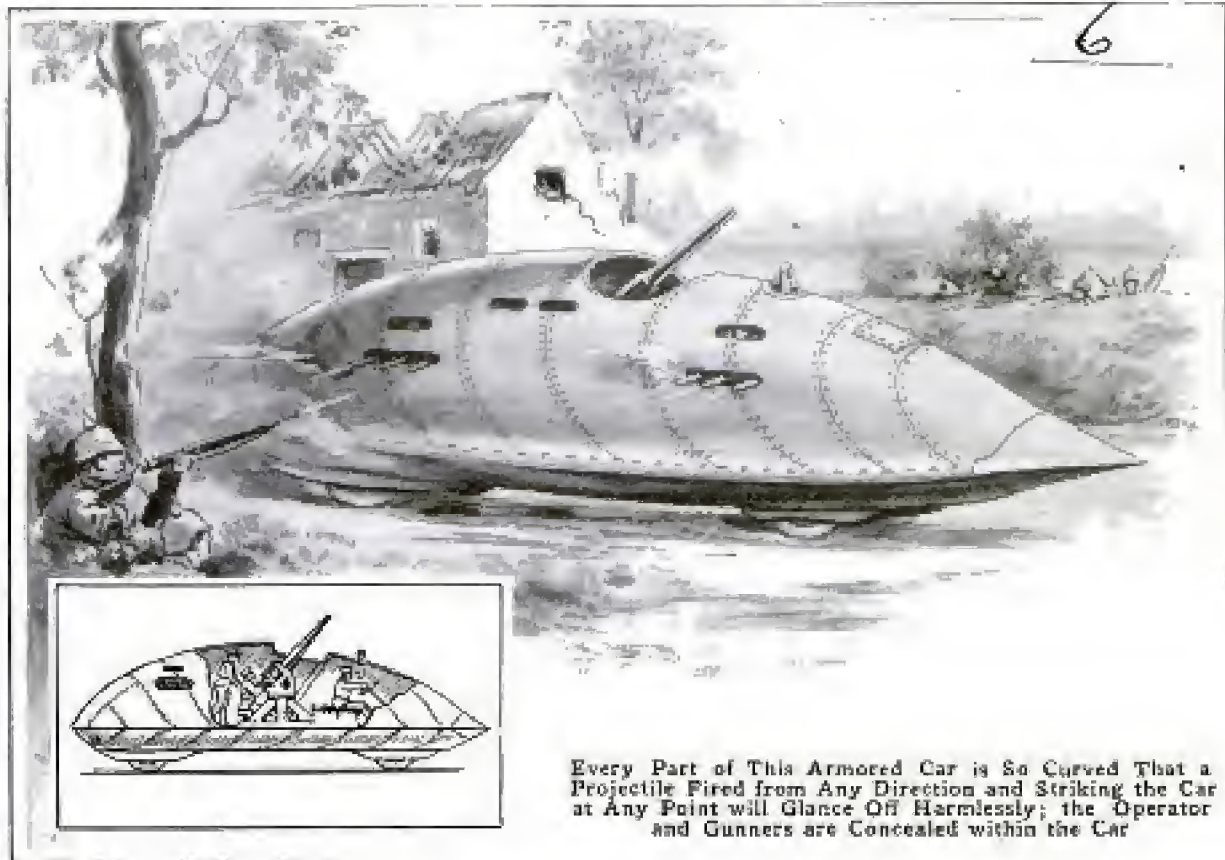
Plants are now shutting down in Italy because of the dearth of these two products. Hard foundry coke which before the war sold at about \$11 a ton is now commanding \$20, and more. Likewise, hematite which was formerly delivered for about \$21 a ton has advanced to \$45 and \$50.

A committee of the Milan Chamber of Commerce is taking up the matter of preparing for trade with America. The problem of finding suitable return cargoes for American steamers is being worked out. It is thought that marble, zinc, and lead hematite, iron ore, cheese, silk, and other products, will meet this demand. An attempt is also being made to establish a financial arrangement between banking interests of the two countries whereby money can be advanced on bills of lading.

NEW ARMORED CAR SHAPED
 6 LIKE A TURTLE

So evidently efficient for war purposes is an armored car recently invented by a naturalized American that the military authorities of several of the warring countries are said to be negotiating with the inventor for its use in the European conflict. The body of the car is made of armor plate and is elliptical in shape, so that from

Chamber of Commerce of the U. S. S. C.
 Chicago, Ill., March 2, 1915.



Every Part of This Armored Car is So Curved That a Projectile Fired from Any Direction and Striking the Car at Any Point will Glance Off Harmlessly; the Operator and Gunners are Concealed within the Car

a distance the car looks like an enormous turtle. Every part is so curved that a projectile fired from any direction and striking the car at any point will have a tendency to glance up or down or horizontally. Even the wheels are protected by curved armor that hangs to a point within a few inches of the ground. At the top of the body is a large porthole for the 4-in. gun that the car is designed to carry, the arrangement being such that the gun can be fired at any angle. At the sides are smaller portholes for rifles, and inside the body is space for four men to stand erect. The driver, who observes the road and the movements of the enemy through a periscope, is entirely concealed and protected from the fire of the enemy.

9943

SIMPLE FAN IS DESIGNED FOR SEWING MACHINE

Intended for use in homes where electric fans are not employed, a rotary fan has been invented which may readily be attached to a sewing machine so as to furnish a cooling current of

air across the work board when the device is in service. The vanes are fastened on a hollow shaft which is arranged to be screwed to the end of the



The Fan Is Demountable and may be Attached or Removed as the Occasion Dictates

axle of the flywheel. The fan, of course, revolves only when the machine is pedaled.

The Attachable Fan Co.
1637 Sacramento St., San Francisco.

CANDY-MAKING MACHINE IS ELECTRICALLY OPERATED

A hundred sugar wafers a minute are turned out without being touched by the hands of the attendant by a new candy-making machine that is operated throughout by electricity. The process of making a batch of the wafers begins with the pouring of 15 lb. of granulated sugar, mixed with a quart of water, into a reservoir at the end of the machine. The mixture drops into a kettle where it is thoroughly boiled by electric heating coils, and an electric gong rings when the boiling has continued the required length of time. With the pulling of a lever the creamy mass is pumped into mixing kettles where it is stirred by electrically operated paddles. At this point the color and flavoring are added by the attendant. After being thor-

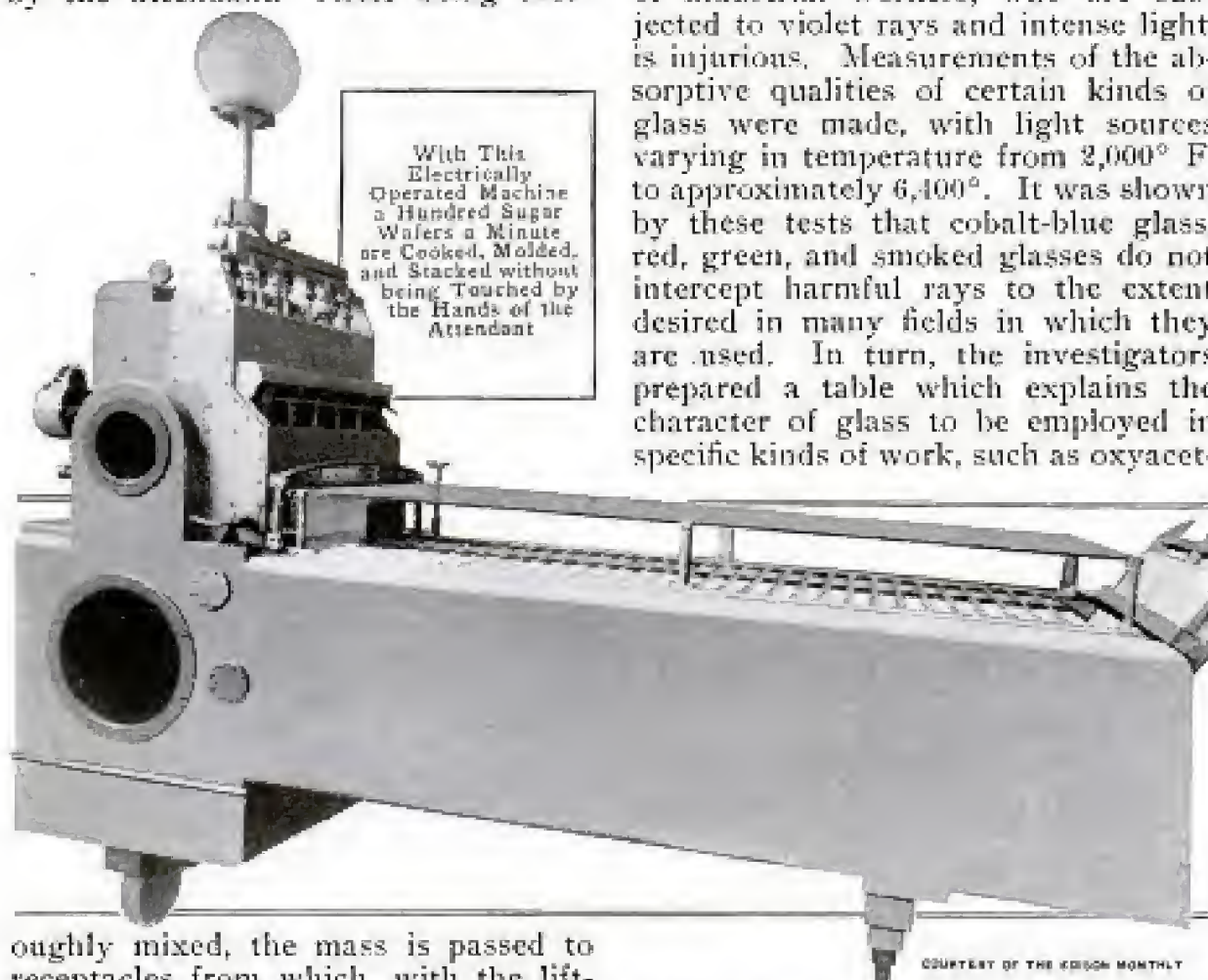
a moving belt that runs the full length of the machine. As the wafers dry they are carried by the belt to the opposite end of the machine where they are deposited automatically in stacks. One of the features of the machine is the use of kettles and other receptacles made of nickel-aluminum, an arrangement that eliminates the old-style copper kettles which, through lack of proper care, were sometimes responsible for the presence of poisons in the candy.

228

LENSES OF WRONG COLORS USED TO PROTECT EYES

How Age July 1-15

According to observations made during the course of research work for an eastern optical company, it was found that more than 90 per cent of the colored glass used to safeguard the eyes of industrial workers, who are subjected to violet rays and intense light, is injurious. Measurements of the absorptive qualities of certain kinds of glass were made, with light sources varying in temperature from 2,000° F. to approximately 6,400°. It was shown by these tests that cobalt-blue glass, red, green, and smoked glasses do not intercept harmful rays to the extent desired in many fields in which they are used. In turn, the investigators prepared a table which explains the character of glass to be employed in specific kinds of work, such as oxyacet-



oughly mixed, the mass is passed to receptacles from which, with the lifting of a clutch, it is deposited in the right quantities in molds mounted on

ylene welding, electric-arc welding, and blast-furnace operations.

228 - *Julius King Optical Co. New York*
10 Maiden Lane
7 W. Madison St. Chicago

Reproductions of Spectra based on researches of Prof. H. Luckiesh - prepared by Julius King

216 # J. R. Schmidt,
 2557 St. Charles Pl.
 Hyde Park, Cinti., O.

DESTRUCTION IN WAKE OF CINCINNATI TORNADO



This Shows the Debris of Five Buildings: Nearly 50 Persons were Buried beneath the Jumbled Mass of Splintered Timbers and Crumbled Bricks



Section of Tin Roof Torn from Building and Caught by Telephone Wires as It was Blown through Air



Above: Rescuers Working at Sixth and Mound Streets Recovering Dead and Injured Victims.
 Inset: Wall of Frame Building Pierced by Plank

The Heavy Roof Shown Below was Carried for a Considerable Distance by the Wind and Dropped on a Sidewalk in Fifth Street near Mound Street



AERIAL TORPEDO NEW WEAPON OF OFFENSE

See Jan'y 16 1915

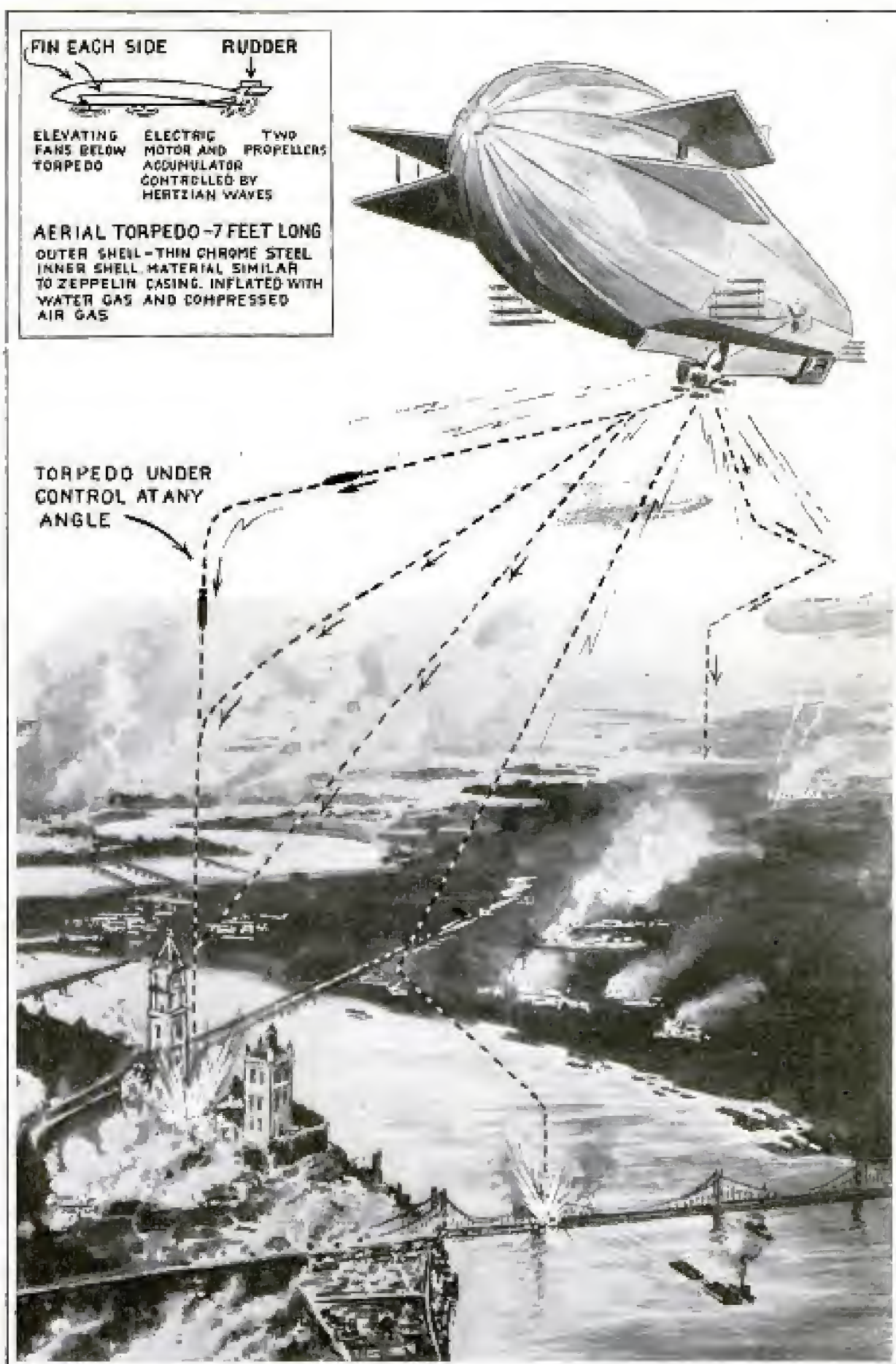
THE fear of overwhelming attacks from the air, which prevailed among the allied nations at the outbreak of the war and until recently, when the comparative ineffectiveness of the Zeppelins seemed demonstrated, is likely to be revived and the terrifying power of these monster airships fully realized if the reports relating to the new aerial torpedo perfected by the Germans prove to be true. Recent press dispatches have told of a peculiar bomb that the Germans are using in shelling the trenches and fortifications of the allies along the western battle front, and of the remarkable accuracy with which these bombs are aimed. The explosion of the bombs is said to be destructive and demoralizing in the extreme, one report telling how an entire section of a Belgian trench, with its occupants, was blown out of the bank of the Yser Canal and into the water. Now it seems that the bombs are aerial torpedoes launched from a Zeppelin and controlled from the navigating bridge by wireless waves. The accounts of the operation of these torpedoes read like one of the fantastic tales with which readers were regaled before the great war became a reality. In many respects the torpedo resembles a submarine torpedo and is said to possess all its destructive power. It is equipped with a delicate wireless apparatus that controls its propelling and steering mechanism, and through this every movement of the torpedo is controlled by the powerful wireless waves sent out from the Zeppelin. As it speeds toward the target the torpedo can be steered up or down or horizontally at the will of the operator. In practice it is simply propelled to a point directly above the object to be destroyed and is then turned vertically downward and dropped like an ordinary bomb.

The new torpedo is said to be about 7 ft. in length and to have a war head like that of a submarine torpedo. In order to allow it to penetrate a roof or

other obstruction before exploding, the war head is equipped with a time fuse that delays the explosion for a few seconds after the impact. Carried in the body of the torpedo is from 100 to 150 lb. of high explosive, enough to cause great havoc, especially when exploded within an inclosure such as a building. The torpedo is driven by two propellers at the stern and is sustained in the air by two propellers working on vertical axes and placed fore and aft under the body. By means of an arrangement of fins and rudders it is kept from capsizing in the heaviest winds. It is believed that the propellers and other mechanism are operated by compressed air.

While this torpedo can doubtless be made enormously more effective than a bomb that is simply dropped, it has one serious limitation when launched from an airship against fortifications or warships. To be safe from the fire of antiaircraft guns the airship must either be at a considerable distance from the target or at a great height above the ground. In either case it would be extremely difficult to determine when the torpedo was anywhere near a point directly above the target. In spite of this, however, the Germans have apparently provided themselves with an exceedingly effective weapon of offense in this torpedo. Its use need not be confined to airships. It may be launched as well against the enemy's trenches from a fixed station, and in the close-range fighting in progress at many points along the western battle front there would seem to be little difficulty in estimating the position of the torpedo and in dropping it accurately at the desired point.

¶The largest addition to the merchant marine in the history of the United States was made during the fiscal year ended June 30, 1915, when 1,373 vessels with a total of 744,618 gross tons were registered. Of these, 147 were foreign-built vessels entered under the ship-registry act of 1914.



COPYRIGHT, THE NEW YORK HERALD CO.

View Showing Action and Control of German Aerial Torpedo as Represented by the English. Wireless Governs the Course of the Projectile



This Shows the General Scene of the Tragedy, One of the Greatest Marine Disasters in History, Which Occurred in the Very Heart of Chicago. Unlimited Life-Saving Facilities Were at Hand in Less than Five Minutes, but for the Most Part They Were Useless. The Victims were Entombed within the Steel-Hulled Death Trap

SUPREME TRAGEDY OF THE LAKES

Overloaded and Topheavy, the "Eastland" Founders at Its Dock in the Chicago River—Faulty Construction of Excursion Boat and Shallowness of Water Are Contributing Causes of the Unusual Marine Disaster

By SEARLE HENDEE

FOR more than eleven years the steamship "Eastland," one of the fastest twin-screw boats on the Great Lakes, navigated without meeting with disaster. It was notoriously topheavy and temperamental. It had a habit of careening, not only when in a heavy sea, but when in smooth water. From the time of its launching it was a constant source of trouble to its owners and navigators alike. But by keeping an engineer at the pumps to trim it whenever it listed dangerously, and on one occasion by turning a fire hose on its passengers to drive them below, the ship carried hundreds of thousands of pleasure-seekers between different lake ports during its career without accident.

But on Saturday morning, July 24, the ship, loaded with 2,500—or more—picnickers, turned over on its port side and sank at its berth in the Chicago River.

The catastrophe occurred in the very heart of the city and before the gaze of thousands of persons. One second there was a din of laughter, shouts of "bon voyage," and the strumming of stringed instruments, the next second there was a bedlam of sickening screams, the swish of churning water, and the hollow groans of death.

How many persons lost their lives is not yet known. A week after the disaster 836 bodies had been recovered and all but one of them identified. Five hundred and seventeen passengers were still missing. The majority of the victims were women, girls, and babies.

It was literally not more than one minute after the steamer had toppled over and lay half submerged with its port side resting on the bottom of the river, that rescuers were at work pulling countless bedraggled forms from the muddy water. In five minutes more, hundreds of policemen, firemen, sail-

ors, dock hands, and volunteers were busy, while river craft of every description were alongside. Several hundred passengers crowded on the starboard of the "Eastland" grabbed the rails, clambered onto the upturned side of the ship, and escaped with their lives. Others at the bow and stern, who were dismayed and weakened by fear, one by one loosened their hold and fell down the perpendicular deck into the water. Many of those who jammed the top decks were hurled free from the superstructure as the steamer went over. Hundreds of women and children on the lower decks and state-rooms were hopelessly trapped.

In an incredibly short time men with oxyacetylene torches were cutting holes in the steel hull through which a few entombed persons were drawn out alive. Subsequently divers penetrated the hold in this way and recovered hundreds of bodies. Before darkness came, poles were erected over the exposed side of the ship and powerful incandescent lamps mounted in reflectors spaced at short intervals to illuminate the hull and allow the work to proceed throughout the night. Other batteries of lights were trained from the opposite wharfs, lighting the river on all sides. As rapidly as the bodies of the unfortunate ones were lifted out of the ship they were placed in waiting ambulances and taken to different morgues.

The cause of the disaster may be found in several things. Primarily the ship was faulty in construction. It was built for speed and not for stability. Its safety depended almost entirely upon the condition of the valves of its water-ballast compartments, of which it had ten. The design of its hull might be compared with that of a canoe, for the lines were graceful, its beam was narrow, and its ends tapered. The bottom was almost as round



Several Hundred of the Passengers Who Were Fortunate Enough to Be on Deck and near the Starboard Rail Crawled onto the Uprturned Side of the Ship and Lived. This Shows Escape of Survivors



Strong, Hardened Men, River Characters Many of Them, Worked with Tears Streaming Down Their Faces



In Places of This Kind, between Decks, There Seemed to Be No End of Lifeless Forms



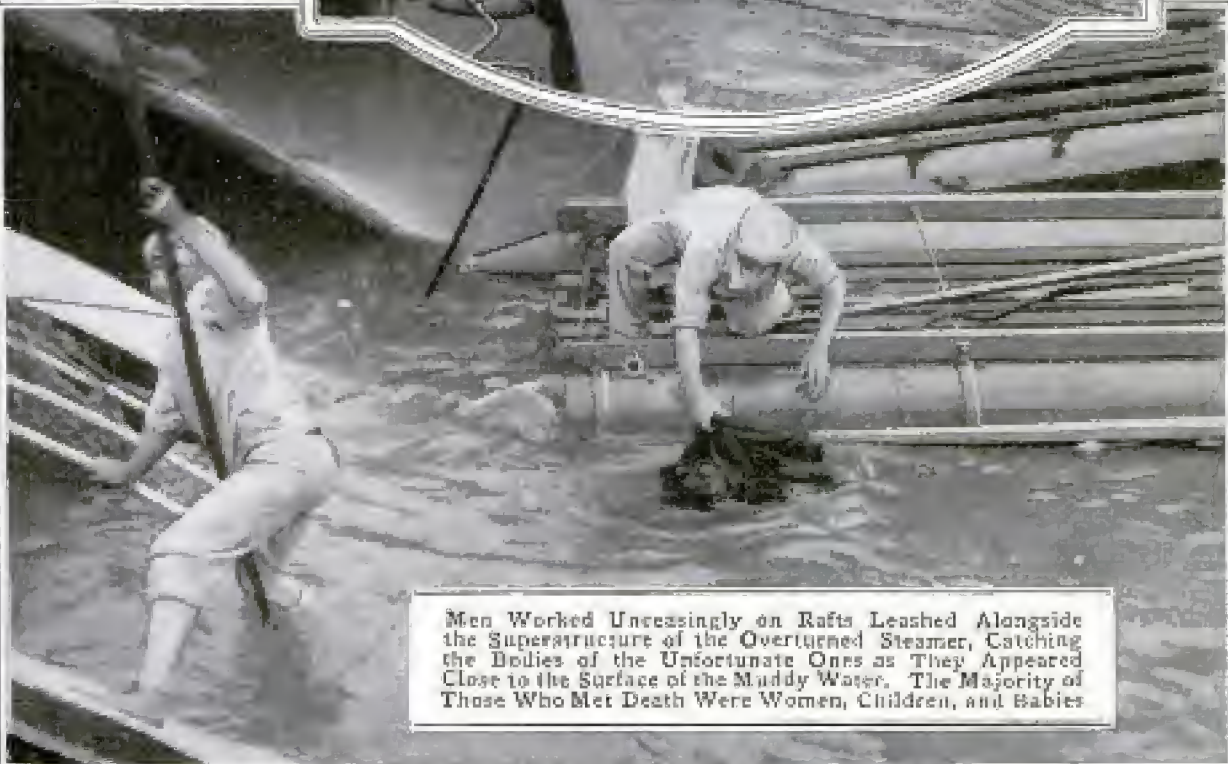
Cutting Holes in the Hull through Which Divers Entered Certain Parts of the Ship



Sailors Taking the Body of a Little Girl from the Water. Scenes of This Kind were Presented Constantly during the Morning and Afternoon Following the Catastrophe. Boats of All Descriptions Patrolled the River for Miles



Huge Nets were Stretched across the Channel at Different Points to Catch the Dead as They were Whirled Away by the Current



Men Worked Unceasingly on Rafts Leashed Alongside the Superstructure of the Overturned Steamer, Catching the Bodies of the Unfortunate Ones as They Appeared Close to the Surface of the Muddy Water. The Majority of Those Who Met Death Were Women, Children, and Babies

as a boiler and there was no keelson. The height and weight of the superstructure, according to competent marine architects, was out of proportion to the body of the vessel. It was fundamentally topheavy.

The draft of the ship could be varied from 10½ to 16 ft. in a short time by taking in, or expelling, water ballast. With the tanks empty and the upper decks of the vessel overburdened with humanity, the condition of the ship was most precarious. Whether or not this was the true situation at the time of the catastrophe is a subject to be determined. It has been asserted as fact by apparently good authorities. It has also been partly denied, the contention being made that some of the tanks had some water in them.

In view of the shallow draft of the ship when its tanks were empty—not an uncommon condition, because it is said to have been the habit of its navigators to expel the ballast when entering the river and taking it on when reaching the lake—its “metacentric height” is an interesting feature to observe. This is the determining factor in the stability of a ship. Technically it is the distance between a ship's center of gravity and center of buoyancy. The greater the metacentric height—or in other words the farther the center of gravity is below the buoyancy point of a vessel—the farther it may list to one side or the other without danger. Similarly, a ship whose metacentric height is ample is not so prone to list. In the case of the “Eastland,” the metacentric height is alleged to have been only four inches. That of the average lake boat is 18 in., while in two recently built passenger steamers entering the port it amounts to 4 ft. 8 in. and 5 ft., respectively. From this it may readily be seen why the ship capsized so quickly after having listed to a certain point.

In the course of testimony before one of the six inquisitorial bodies investigating the catastrophe, it was asserted that the ship's engineer tried for 17 minutes to trim the vessel after it first commenced listing when pas-

sengers were taken aboard. Attempts were made to take water into the starboard ballast tanks in order to straighten the steamer, which was listing dangerously to port. A few minutes before the end came the vessel righted itself and it was thought the trouble had been overcome. Almost immediately, however, it again slipped toward the river, this time gradually listing more and more until it suddenly overbalanced completely and settled into the water. There is some possibility that the starboard side of the ship was grounded, and that this expedited the tragedy.

Most of the passengers were ignorant of danger, although many on the docks feared the listing long before the disaster occurred. The vessel was so completely jammed, it is said, that it was difficult to work from one side to the other of the decks; which indicates that the load was distributed. The aggregate weight of the passengers, in any event, could not have amounted to more than 165 tons, a load not great enough to capsize a thoroughly seaworthy, well-built boat of the “Eastland's” size.

The “Eastland” was built at Port Huron, Mich., in 1903. It had an overall length of 275 ft., a 38-ft. beam, and mounted engines capable of developing 3,500 hp. It was designed to make a speed of 20 miles an hour, but on one occasion exceeded this by reaching Chicago 3 hours and 44 minutes after departing from South Haven, Mich., a distance of 79½ miles. At different times attempts were made to correct its faults by making changes in its superstructure. The ship's rating was changed frequently. At one time it was allowed by Federal inspectors to carry 3,500 passengers. This number was cut at Cleveland a number of years ago, when the right was given for it to carry 143 passengers at all times; 653 persons while remaining within five miles of land, and in water not deep enough to submerge the boat, 2,000 passengers. It listed badly on its trial trip, broke a propeller shaft, and was forced to return to its dock.



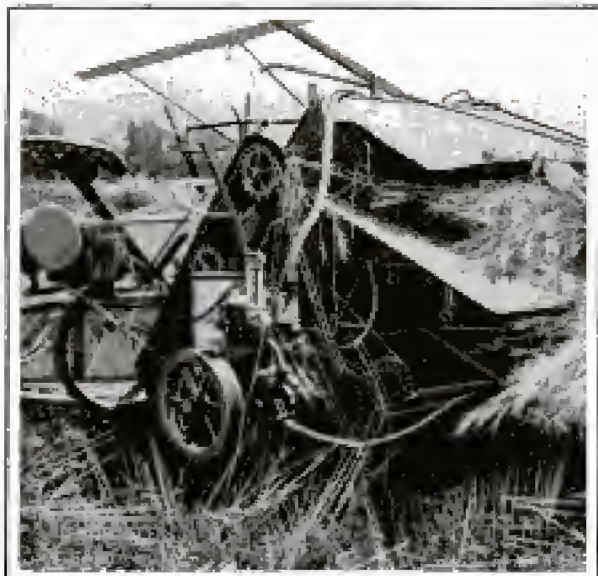
Above: Ill-Fated "Eastland" Prostrate beside Its Berth in the Chicago River, Hemmed In by Tugs, Patrol Boats, and Wrecking Barges. Left: Darkness did Not Halt the Work of Recovering the Hundreds of Bodies Imprisoned inside the Vessel. Powerful Incandescent Lamps Illuminated the Ship and the Water about It



One Corner in the Hall of Horror, the Second Regiment Armory, Where Hundreds of Bodies were Taken After being Recovered from the Sunken Excursion Boat

GASOLINE MOTORS AND BEER KEGS SAVE WHEAT CROP

Incessant rains in many sections of the Southwest mired the wheat fields and made the recent harvest a very



When a Gasoline Motor is Used to Operate the Cutting and Binding Mechanism It Is Much Easier to Get a Machine over Muddy Ground

difficult one. Quite generally farmers experienced serious difficulty in operating their binders, for the wheels would sink far into the mud, making it nearly impossible for horses to progress. This condition, which taxed the ingenuity of many agriculturists, created a wide demand for empty beer kegs and small gasoline motors. The former were used, particularly in Kansas, to assist in supporting the weight of the binders, thus relieving the bull wheels of the



Using an Empty Beer Keg to Save a Wheat Crop

machines from some of the pressure and preventing them from sinking hub deep.

By reinforcing the ends of an 8-gal. keg, boring a 2-in. hole through it and employing a heavy iron pipe as an axle, an excellent broad-tread, auxiliary wheel was produced. This was placed immediately back of the driving wheel on a binder. Owing to the additional supporting area thus provided it was frequently possible for a three-horse team to get through fields that otherwise would have been utterly impassable.

In other instances, small motors were attached at the rear of the binders and made to drive the cutting and shocking mechanism. Obviously, this relieved the horses of a considerable load and allowed them to make headway. Although adding weight to a binder, the arrangement lessens the drag of the bull wheel and decreases the likelihood of miring.

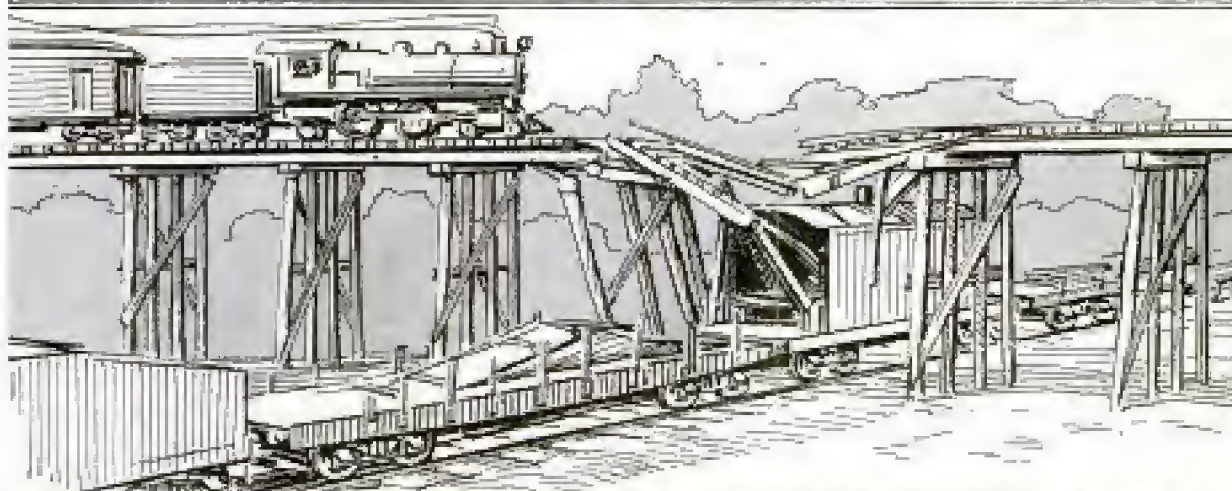
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NAVY TAKES CONTROL OF SAYVILLE WIRELESS

Owing to alleged violations of the neutrality of this country the wireless station at Sayville, L. I., which is said to be German-owned, was taken over by the United States government on July 8, 1915, and will be operated by the Navy Department, probably until the end of the European war. Aside from specific complaints that the neutrality of the United States had been violated in the operation of the station, one of the principal considerations of the government authorities in taking control was the possibility that the station was being used for direct communication with German submarines operating on the other side of the Atlantic. The station will be open for the transmission of commercial messages to and from Germany, but no code messages of any kind will be accepted.

Consideration is being given a plan for substituting motor trucks for street cars in the Chicago mail service.

Radio Station



There Was No Time to Signal the Passenger Train, Which Broke through the Sagged Portion of the Trestle and Crashed onto the Work Cars Below

QUEER TRAIN WRECK OCCURS IN WASHINGTON STATE

Several fatalities resulted from a railway wreck of a most unusual nature which recently occurred near Rainier, Wash. At the point where the tragedy happened the tracks of one railroad company cross those of another on a 30-ft. trestle. A work train was passing beneath the elevated structure carrying a steam shovel on a flat car as a passenger train approached overhead. The heavy steel boom of the dredger suddenly became unleashed and struck out just in time to hit the wooden trestle violently and weaken some of its supports. Almost at the same instant

the passenger train shot onto the sagging section, smashing through and falling on top of the work train. Only the observation car of the passenger remained on the elevated structure.

1/15

PENNSYLVANIA SUFFRAGISTS HAVE "LIBERTY BELL"

At the same time that the Liberty Bell was being transported across the continent from Independence Hall at Philadelphia, a replica of it, known as the women's liberty bell, was carried over the state of Pennsylvania by suffragists campaigning for state recognition. This instrument, which weighs approximately 2,000 pounds, was se-

Presented by

Mrs. Ruschenberger

Copyrighted material
Phila., Pa.

Jan. 1 Bechdel
358 Prospect St.
Seattle, Wash.

curely mounted on a motor truck and accompanied by a delegation of women



At the End of the Truck Is a Speaker's Platform from Which the Women Gave Their Talks in the Different Places Visited

on its long tour. It is said never to have been rung, and according to present plans will not be sounded until equal

suffrage is granted in the Keystone State. Crowds of persons gathered to see the bell everywhere it was shown.

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PUBLIC MOVIES ARE HELD

IN BOSTON PARKS

Moving Picture World

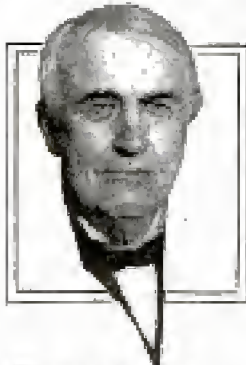
Municipal motion-picture shows were held in the public parks and recreation grounds of Boston during the middle part of the summer. The scheme was promoted by several social-propaganda organizations, the mayor, and the park and recreation department of the local government. The programs were changed and the pictures displayed in public places in different sections of the city five evenings each week. Films of an educational nature, and those dealing with health and civic subjects, dominated the exhibitions.



BOMB WRECKS EAST ROOM IN NATIONAL CAPITOL

THIS photograph shows the extent of the damage done in a senate reception room on the second floor of the Capitol by the explosion of an infernal machine placed over the telephone booths by a crazed German sympathizer. The blast occurred shortly before midnight on July second. The windows in the room were blown out, a large plate-glass mirror was demolished, and the walls and fixtures were injured. No serious damage was done to the building itself, however.

International News Service.



Thomas A. Edison,
Advisory Head Naval
Board of Inventions

BOARD OF EXPERTS TO STUDY NAVAL PROBLEMS

ASIDE from its importance as a step toward the provision of adequate national defense, the work of the naval board of inventions now being organized by

Secretary Josephus Daniels is practically certain to result in a tremendous stimulus to inventive genius in this country. As demonstrated in the European conflict, modern warfare has become largely a matter of chemistry, machinery, and high explosives, and scientists and inventors are coming to have as important a part in it as the men engaged in the actual fighting. Heretofore, American inventors have complained that their best endeavors met with scant encouragement from the United States government, and that as a result they have been compelled to sell their inventions to foreign governments. This condition is to be radically changed. Under the supervision of the board, American inventors will not only be encouraged, but will be given substantial aid in the way of suggestions, in developing any new devices and methods that will in any way increase the efficiency of the fighting equipment of the United States. According to a statement given out by Secretary Daniels, the purpose behind the creation of the board of inventions is a "mobilization of the inventive genius of the country."

The board is to be headed by Thomas A. Edison and is to be composed of men prominent in technical and scientific lines. It will act in an advisory capacity to the secretary of the navy. A number of well-known inventors are reported to have volunteered their services, among them being Alexander Graham Bell and Orville Wright. In order to enlist as wide a cooperation as possible among men best qualified to assist in the work, eight of the leading technical and scientific societies of the country have each been asked to desig-

nate two members to serve on the board. Following almost immediately after the announcement of the organization of the board came the organization of the American Society of Aeronautic Engineers, which is to be composed exclusively of experts in the construction and operation of air craft. This society is to work in close touch with the board of inventions.

Although the entire plan is still in a formative stage some of the details have already been worked out. The question of securing greater efficiency in submarines and air craft will be taken up immediately, along with any devices calculated to increase the efficiency of the navy. Probably one of the first problems to be considered will be means for defending warships against torpedoes, a problem that is already being considered by the British naval experts and that is said to be near a solution. Any plans for the upbuilding of the navy and for increasing its efficiency, after being approved by the board, will be submitted by the secretary of the navy to Congress with a recommendation for action. Among the facilities definitely planned at the present time is a laboratory for carrying out naval experiments.

One of the most important features of the plan is the attitude that is to be taken toward inventors. As fast as the needs of the navy become known, it is the intention to give them the widest publicity. When a subject is particularly technical and there are baffling conditions not known to civilian inventors, specifications will be prepared setting forth the requirements in detail and these specifications will be sent to inventors who are best qualified to work on the problem. With the complete working out of the plan it is expected by Secretary Daniels that the United States will be placed "in such a state of defense as no other country has ever known."



Josephus Daniels,
Secretary of the
United States Navy

MANY MOTOR CARS LICENSED IN THE CANAL ZONE

C. S. Monitor.

One hundred and ninety automobiles and 85 motorcycles are licensed to operate in the Canal Zone. Sixty-two of the former vehicles are owned by persons residing in the zone, while the rest belong to citizens of Panama and Colon. The licenses are divided into three classes; one being for pleasure cars, the second for hacking vehicles, and the third for trucks. Those who obtain their original permits in either of the aforementioned cities, or in the zone, are granted reciprocal rates in the other places. A charge of one dollar is made in the zone for a license tag, which is issued by the chief of the division of civil affairs at Balboa Heights.

MAGNETIC SURVEY OF EARTH PROGRESSING

Canal Record.

The "Carnegie," a yacht built by the Carnegie Institution and placed in service in making a magnetic survey of the earth about five years ago, is again engaged in the same work. It passed through the Panama Canal early in the summer, and, after touching at Honolulu, is now cruising in the

South Pacific and will finally circumnavigate the south pole, keeping as far south as ice conditions will permit. The magnetic survey of the earth is now about three-fourths completed.

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IRRIGATION WORKS UNHURT IN IMPERIAL VALLEY

Engineering Record July 15

Although there was loss of life and a considerable amount of damage done to buildings in various towns when the Imperial Valley of California was severely shaken by an earthquake recently, the extensive irrigation works of the district escaped practically without injury, according to late reports. The loss in property is believed to have been approximately \$1,000,000, although various estimates, both above and below this amount, have been made. The casualty list was remarkably small in view of the violence of the earth tremors. The reason for this is that a slight shock, which gave warning of danger, preceded the heavy and destructive vibrations. The first tremors came in time to cause many persons to rush into the streets soon enough to escape being crushed to death beneath the debris of falling buildings.



Calexico, a Border Town in Southern California, Suffered Seriously. This Shows a Partly Destroyed Building Which Fared No Worse than Many Others

NEW AND CURIOUS DEVICES EMPLOYED IN WAR



Crew of This Austrian Flying Boat Surrendered to Italian Marksmen



German Soldiers Examining Two Unexploded Bombs Dropped from a British Aeroplane near the Ypres

The Swivel, Swinging Seat, and Machine Gun Move Together, Enabling the German Marksmen to Keep His Rifle Trained Constantly on an Aerial Target



Zepplin Aerial Torch: Lighting Agent Contained in Cylinder Suspended from Parachute

BRITISH AEROPLANE FELLED BY GERMAN FIRE



Photo Courtesy: Associated Press

WHILE flying at a height of several thousand feet above the German lines a British reconnaissance aeroplane was sighted by lookouts. Aerial and machine guns directed a continual stream of bullets at the machine for several seconds. Some of them struck their mark. The small craft swerved in the air, burst into flames, and tumbled and over end to the earth. There was little but smoldering sticks and snarled wire and metal remaining of it. The motor and broken propeller were found some distance from the rest of the wreckage. The bodies of the pilot and observer were charred beyond recognition. They were buried shortly afterward with military honors by the enemy.

ALLIES LAND TROOPS BY INGENUOUS RUSE



By Outwitting the Turks, the British Landed Troops on Gallipoli Peninsula Almost without Effort. Men were Hidden between Decks on a Transport Set Adrift as if Abandoned. When It Ran Ashore, Doors Concealed near the Bow were Opened, Wide Gangplanks Dropped and the Force Rushed Out, Protected by 12 Guns Secluded on the Poop

WITH THE ALLIES IN DARDANELLES CAMPAIGN

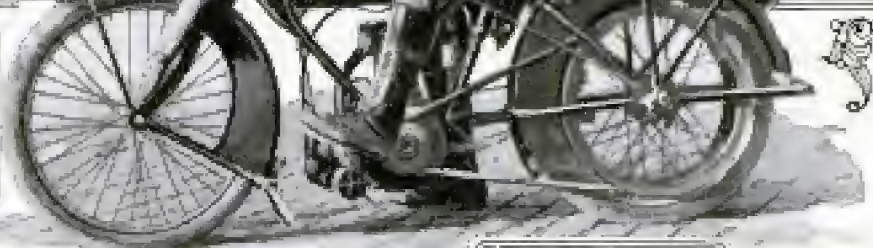


PHOTOS COPYRIGHT, UNDERWOOD & UNDERWOOD

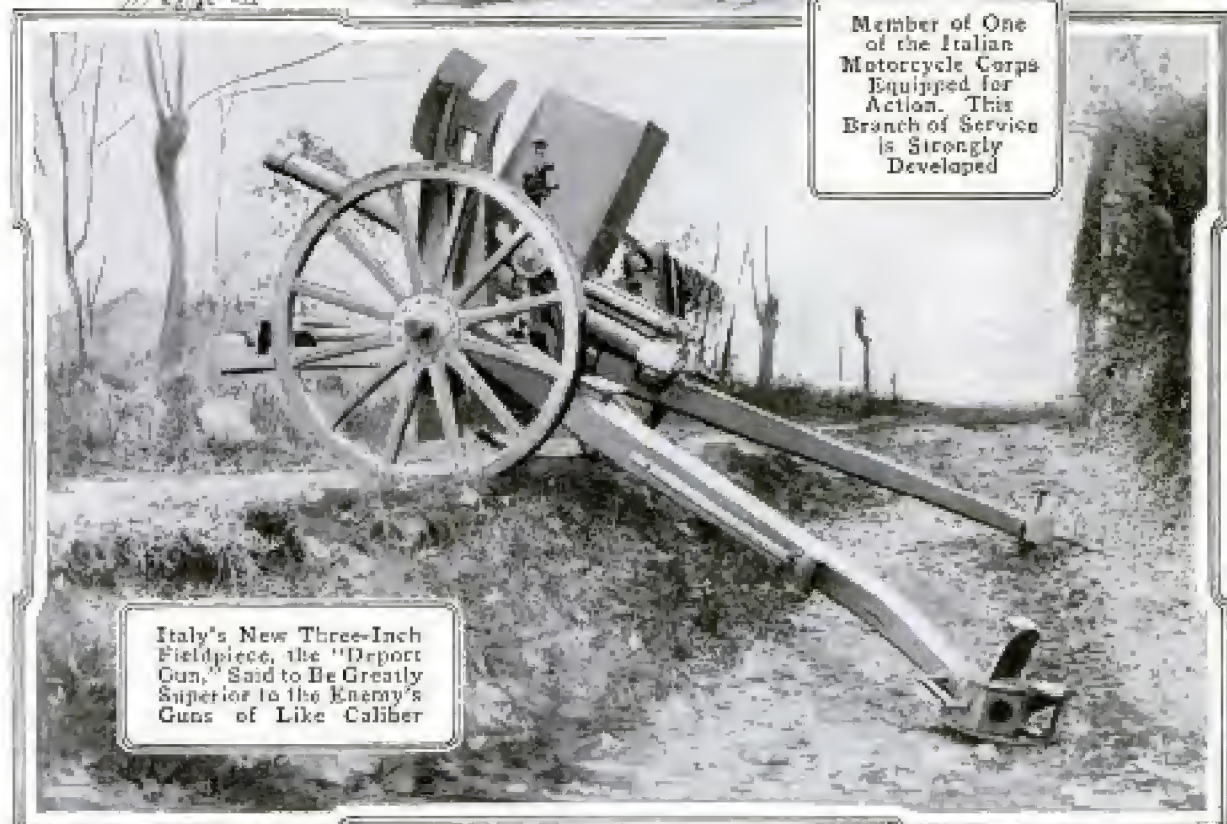
ITALY AND THE WAR AS SEEN BY THE CAMERA



When War was Declared Mobbs Swept through Milan Destroying Every Vestige of German and Austrian Property to be Found in Their Paths



Member of One of the Italian Motorcycle Corps Equipped for Action. This Branch of Service is Strongly Developed



Italy's New Three-Inch Fieldpiece, the "Deport Gun," Said to Be Greatly Superior to the Enemy's Guns of Like Caliber

SERBIAN FORCE CHARGING AUSTRIAN POSITION



NEW war pictures of European battle fields have given closer or more striking views of actual fighting than this, which shows Serbian infantrymen making a desperate charge against the enemy's advance trench concealed in the woods in the background. The attack is being made in the face of heavy rifle and artillery fire. The remarkable precision of modern artillery and its tremendous value in field operations are indicated. The shell which has just burst at the left was fired from a Serbian battery and exploded near the point at which the sudden movement is headed. This affords a momentary cover under which to make the final dash and rout the Austrians at the point of bayonets. A few seconds after the picture was snapped the trench was taken.

TYPICAL RUTHENIAN BUILDINGS IN GALICIA



The Peasant Farm House Above Is That of a Ruthenian Family in Galicia and is Occupied by German Soldiers



German Advance Trench, Unprotected from Shrapnel but Well Concealed

Below Is a Ruthenian Church on the Frontier Used as a Workshop by the Germans



GERMAN THEATERS SHOW "FAKED" WAR FILMS



STRIKING SCENES IN GERMAN MILITARY CAMPS



German Aerial
Photographer
Developing
Negatives in
His Motor-Car
Dark Room

When Asleep
This Guard,
with Receivers
at His Ears, Is
on Duty Also

German Company Tailor
and His Shop near
Rheims. Curiously the
Word "Gibraltar" on the
Uniform Is a Badge
Commemorative of the
Regiment's Campaign
with the British in 1794,
at Gibraltar

RAILWAYS AND ROADS PUSHED THROUGH GALICIA



Germans Projecting Railway Lines in Eastern War Zone to Facilitate the Movement of Troops and Munitions. The Soldiers Are Former Railroad Employees and Are Therefore of Particular Value for This Kind of Work

Main Arteries Extending into Russia are being Macadamized by the Germans



WAR-TIME ROLES OF BRITISH WOMEN AND GIRLS



IN MIDDLESEX WOMEN HAVE TAKEN MEN'S PLACES IN THE HARVEST FIELDS, AS THEY HAVE IN THE SHOPS AND FACTORIES IN VARIOUS CITIES



IT IS NOT UNCOMMON TO SEE A GIRL DELIVERING MAIL BY BICYCLE IN THE RURAL DISTRICTS



SHORT SKIRTS PERMIT BRITISH WOMEN TO WEAR ANKLE BANDS ADMONISHING MEN TO ENLIST



THESE GIRLS HAVE UNDERTAKEN MEN'S WORK IN AN ENGLISH FACTORY AND ARE HERE SHOWN PARTICIPATING IN ONE OF THE PERIODICAL FIRE DRILLS

SLAVIC ARMIES UNDER FIRE ON EASTERN FRONT



Thousands of Russians are Hidden Here in Trenches Extending along a Wide Front. Their Bayonets Seem to be Growing Out of the Ground



Two Russian Soldiers behind the Lines Making Tea in a Samovar, Which One of Them Carried with Him



When This Picture was Taken, the Band, Which Belongs to a Crack Moscow Regiment, had Been through 34 Separate Battles

SINKING OF BRITISH BATTLESHIP "MAJESTIC"



This Photograph was Taken Three Minutes After the "Majestic" had been Struck by a Torpedo in the Dardanelles. The Ship Listed to Port So Suddenly That Every Loose Object, Men Included, Slid off the Decks Only to Become Entangled in the Great Torpedo Nets. A Minute Later It Turned Completely Over and Disappeared

SOME OF THE LESS HARROWING PHASES OF WAR



German Prisoners Interned on a British Estate have Built This Miniature Replica of Wilhelmshaven and the Kiel Canal during Their Recreation Hours



Reproduction of the Iron Cross, Which may be Seen Wherever There Are Germans, Worked on a Terrace



Comfortable, Quiet-Looking Quarters Occupied by Some of the Kaiser's Lieutenants in Russian Poland. Every Possible Convenience Is at Hand

RUIN MARKS PATH OF RETREATING RUSSIANS



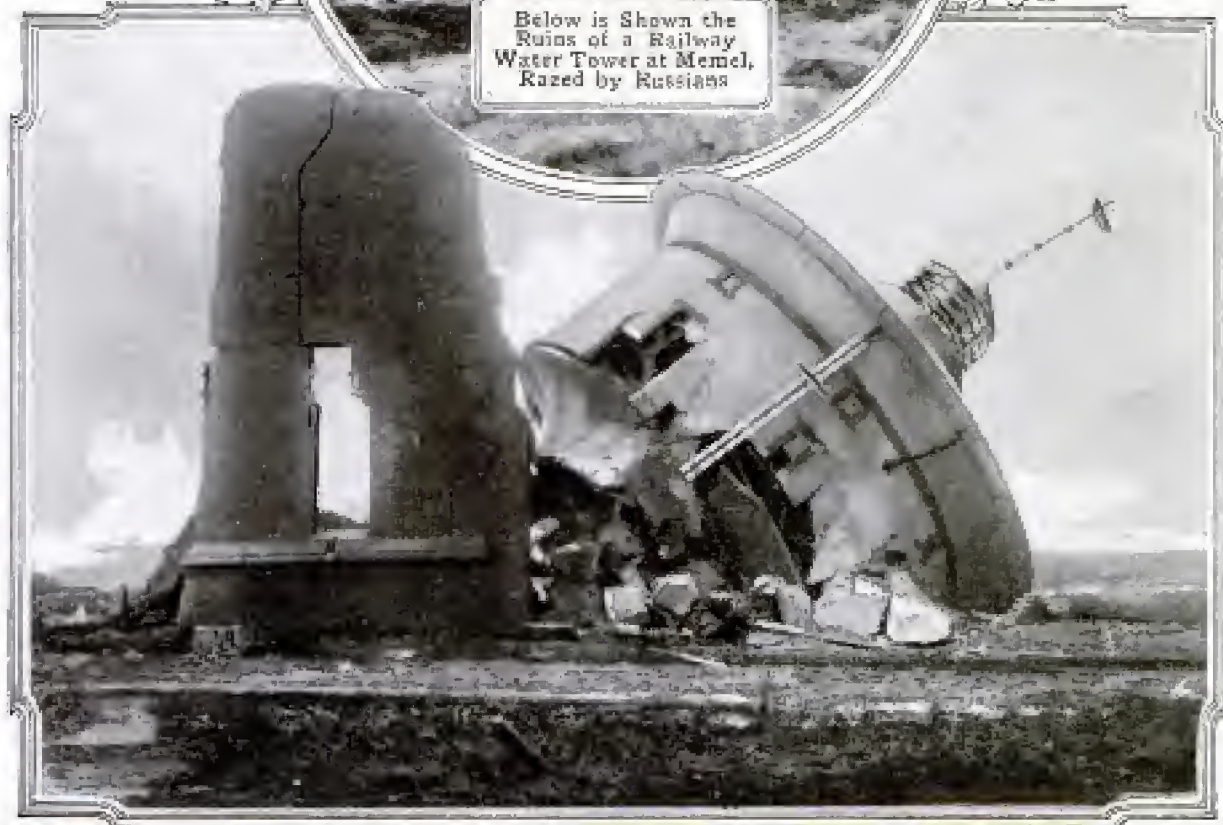
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In Falling Back
 through
 Galicia, the
 Russians De-
 stroyed All the
 Bridges



This Traction
 Engine in a Field
 on a Polish Farm
 was Wrecked
 by a Spent Shell

Below is Shown the
 Ruins of a Railway
 Water Tower at Memel,
 Razed by Russians



COMBINED FAN, TIRE PUMP, AND HORN

One of the latest features in automobile equipment is a fan, tire pump, and horn combined, the whole apparatus being operated by the fan shaft. The vibrations

"Beartone"



Mechanism of the Combined Fan, Tire Pump, and Horn

that sound the horn are produced by the rubbing of a ratchet against a diaphragm mounted on the end of the fan hub. Ordinarily this ratchet, which is mounted on the stationary spindle on which the hub of the fan works, is held away from the diaphragm by a spring. When the horn is to be sounded a button on the end of a flexible cable is pressed, and this moves a rod within the spindle, which pulls the ratchet to a bearing against the diaphragm. The tire pump has a single cylinder and is mounted on a frame attached to the rear of the fan bearing. The drive is through a worm gear on the fan hub. When not in use the pump is slid upward on the frame so that the gears do not mesh. One of the novel features of the pump is an automatic gauge which may be set to operate at any pressure and which blows off when the tire has been inflated to this pressure.

OLD AND YOUNG ALIKE PLAY CHESS IN SAXON TOWN

Reclams Universal

Strobeck, a small Saxon village not far from Halberstadt, is probably the only place in the world where chess is taught in the schools. There, however, the children carry their game boards through the streets just as many youngsters in American villages pack their slates between home and school.

Chess in Strobeck is just as much a study as is reading or arithmetic. Everywhere in the community every one plays. Young and old, men, women, and children alike, study over their chessboards day in and day out. Games may be seen in progress in the homes, in the gardens, and in public gathering places at almost any time.

The reason for this practice is somewhat clouded. But, according to an old legend which doubtless holds some elements of fact, the custom originated in the eleventh century when Bishop Buko of Halberstadt took refuge in the town after being exiled by Henry IV. As the story goes, he lived in an old tower, which still stands today, and spent his time teaching the villagers the game of chess. Regardless of whether this is true, chess as played at Strobeck is quite different from the modern game, and conforms closely to rules known to have been followed as early as the fifteenth century.

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METAL-SPRAYING GUN USED IN MAKING METAL FOIL

Prometheus 1-5-15
The metal-spraying gun, originally invented to take the place of electrolytic apparatus for plating metals, is now being used in the manufacture of metal foil, and it is claimed that with this device the foil is produced much more economically than by the old process of rolling. In using the gun it is necessary to spray the molten metal on a surface of such a kind that the metal foil will not stick after it has hardened. A revolving glass or porcelain drum, highly polished, is used for this purpose, the metal being sprayed in an even film by one or more of the guns,

depending on the width of the band to be made. This drum is kept cool by contact with a second drum which dips into a vessel containing water. The metal foil as formed is led off in an endless band and wound around a third drum. The metal-spraying gun was described in the February, 1914, number of this magazine. 261

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BIRD ISLAND OF PACIFIC REPRODUCED IN MUSEUM

As a result of several years of endeavor, a cycloramic reproduction of Laysan Island, a small atoll northwest of the Hawaiian group in the Pacific and inhabited only by birds, has been made for the zoölogical museum of the University of Iowa. The background of this consists of a painted canvas, 136 ft. long and 12 ft. high, which has been most skillfully joined with the foreground. Great ingenuity has also been exercised in building the latter, which, although made of artificial materials, closely resembles the coral sand and rugged phosphate rocks of the reef. A large number of tropical birds, captured during a special expedition to

the island, are stuffed and set in a life-like manner amid the imitation brush, grass, and rocks. Gray-backed tern, man-o'-war birds, albatross, honey eaters, golden plover, and many other interesting creatures, are shown.



Glimpse of
Cyclorama
Which
Shows Ingen-
ious Joining of
Background
and
Foreground



Artificial Materials were Used in Making the Underbrush and Sea Grasses as Well as the Rocks and Cliffs.
The Birds, All of Which are Stuffed, were Captured on Laysan Island

Prof. Homer R. Dill
State University, Ia.
Iowa City,

E. L. Roney
St. Paul Dispatch.

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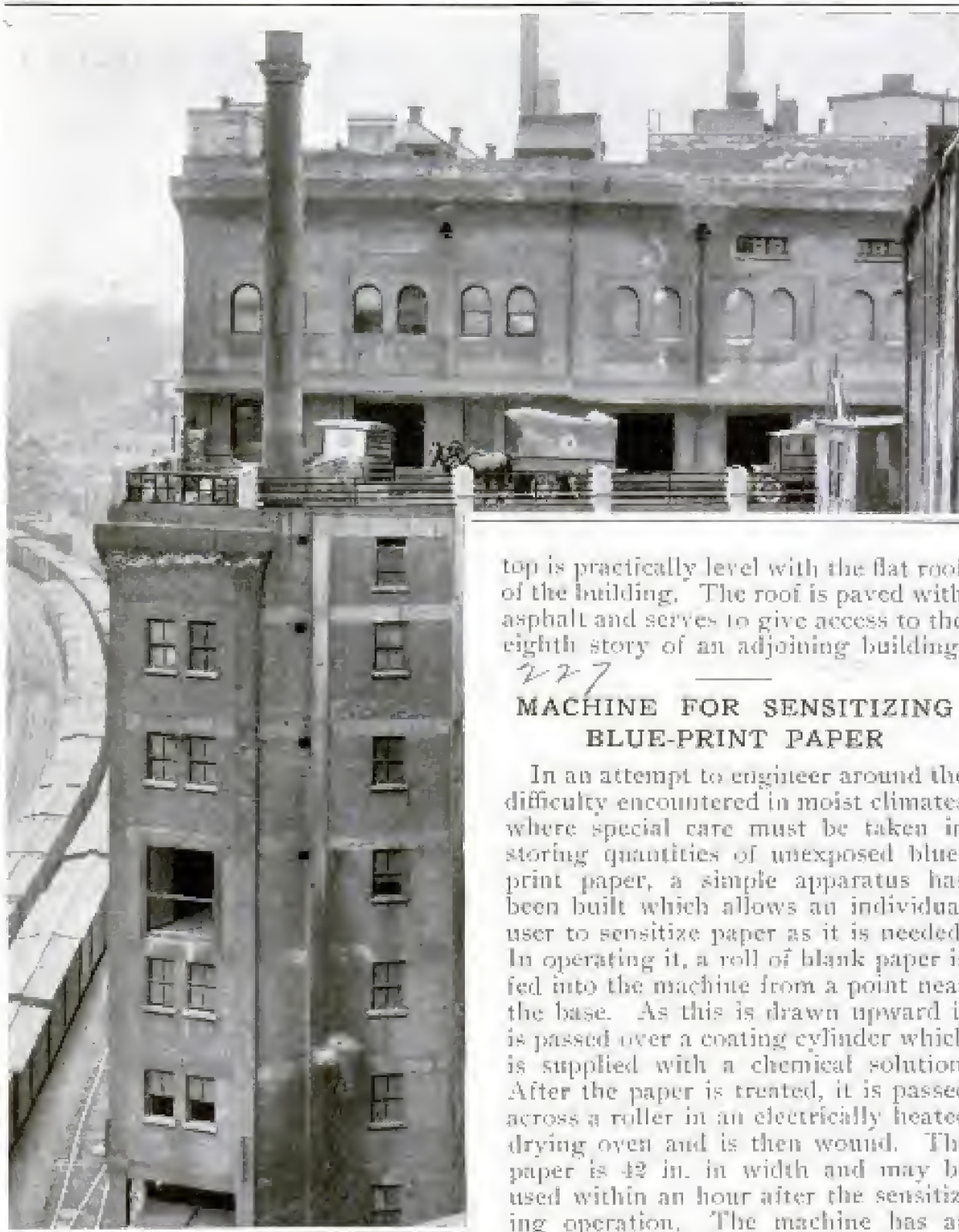
POPULAR MECHANICS

St. Paul, Minn.

STREET ENDS ON ROOF OF SEVEN-STORY BUILDING

A street that ends on the roof of a seven-story building is one of the novel

features of the street system of St. Paul, Minn. This arrangement is brought about through the location of the building against a steep sidehill, the hill being of such a height that its



One of the Principal Streets of St. Paul, Minn., Ends on the Roof of This Seven-Story Building

top is practically level with the flat roof of the building. The roof is paved with asphalt and serves to give access to the eighth story of an adjoining building.

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MACHINE FOR SENSITIZING BLUE-PRINT PAPER

In an attempt to engineer around the difficulty encountered in moist climates where special care must be taken in storing quantities of unexposed blue-print paper, a simple apparatus has been built which allows an individual user to sensitize paper as it is needed. In operating it, a roll of blank paper is fed into the machine from a point near the base. As this is drawn upward it is passed over a coating cylinder which is supplied with a chemical solution. After the paper is treated, it is passed across a roller in an electrically heated drying oven and is then wound. The paper is 42 in. in width and may be used within an hour after the sensitizing operation. The machine has an output varying from 150 to 200 yards an hour.

C. F. Pease Co.
H. H. Adams, Chgo.
113 Institute Pl.

SMALL SHOPS TURNED INTO AMMUNITION FACTORIES

One of the curious effects of the war on Canadian industry is the extent to which small shops scattered all over the Dominion, and formerly engaged in making hardware and other materials for ordinary use, have been transformed into ammunition factories to aid in supplying the needs of the British troops in the field. The fact that so much of this work is being done in small shops makes the situation radically different from that in this country, since most of the war materials supplied the allies by American makers are produced in the biggest steel mills. A good example of the way in which many Canadian manufacturers have entirely changed the character of their output since the war began is given in the case of a shop formerly engaged in the production of door locks, small planes and vises, and a general line of small hardware. All the resources of this shop are now given to the making of shrapnel shells. At the present time more than 150 machine shops in Canada are engaged in making shrapnel shells or the parts composing them. In spite of the fact that much of the work is being done with machinery and tools that are little better than makeshifts, large quantities of shells that meet the rigid requirements of the government are being turned out.

Since it possesses the maximum destructive power with relation to the labor required in handling the shell

and the gun that fires it, the 18-lb. shrapnel shell is the one that is most used and is therefore most in demand. Before it reaches the machining stage this shell goes through about fifteen operations, and after the machining is



Tin Caps in Which the Bursting Charge is Placed

Furnaces for Heat Treatment. Left: Testing Shells for Hardness

As Soon as the Nose of the Shrapnel Shell has been Pressed into Shape It is Treated by a Bath in Quicklime

done there are various steps such as loading with lead balls and rosin. The high explosive that goes into the shell is never put in at these shops but at the government arsenal, since this work is fraught with the greatest danger and can only be undertaken by men trained in the handling of high explosives.

¶The British height record for aeroplanes, formerly 14,500 ft., has been broken by a Sopwith biplane which reached an altitude of over 20,000 feet.

386
9763

POPULAR MECHANICS

SCHOOLBOYS BUILD HOUSES FOR CITY'S BIRDS

In an effort to stimulate the interest of the boys of the city in the protection and care of song birds, the department of vocational education in the public schools of Elgin, Ill., set the pupils at work constructing bird shelters. Within a few weeks' time some three hundred small houses, and a number of large ones designed for martins, had been built and erected. After this undertaking had been completed an illustrated lecture was delivered to the children by a bird authority.

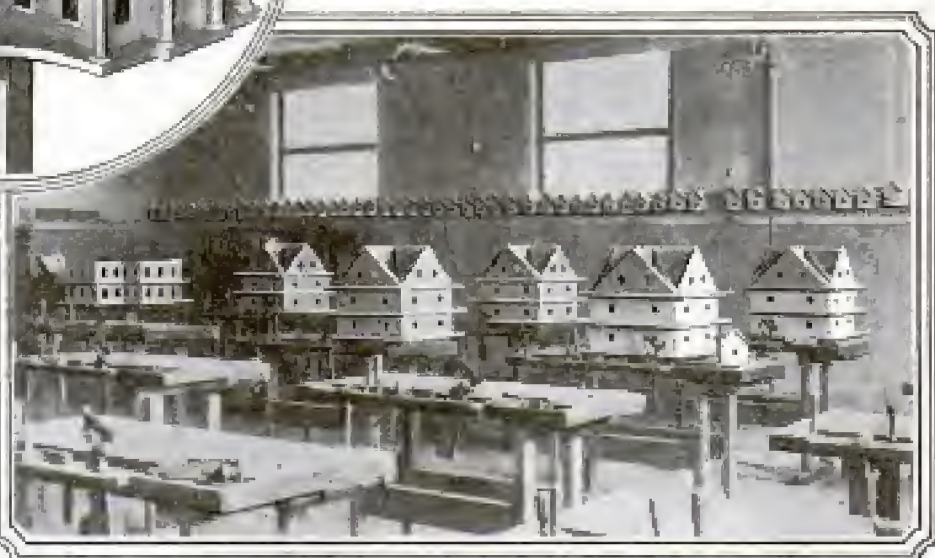
In the seventh grade each boy built a small shelter as a class exercise. These were made of $\frac{3}{8}$ -in. basswood and protected with two coats of

paint. They were then erected by the boys on the grounds at their homes. The

Martin Houses with as Many as 54 Rooms were Built and Placed in the Municipal Parks. The Purpose of This Undertaking Was to Arouse the Boys' Interest in the Care of City Birds



Altogether More than 300 Bird Houses were Constructed in the Time Allotted for the Work. In Most Instances These Became the Property of Their Respective Builders and were Erected by Them in the Yards at Their Residences, Thus Continuing the Children's Interest in Birds Outside of School



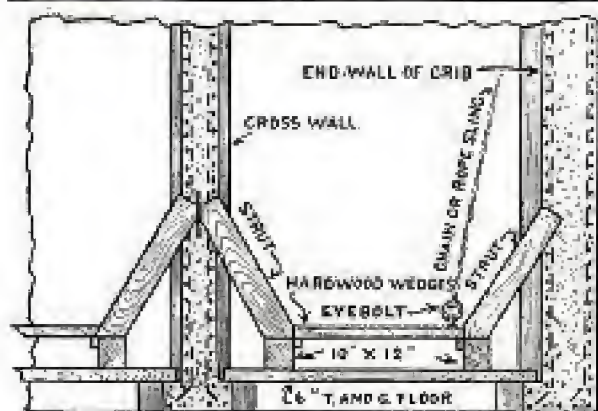
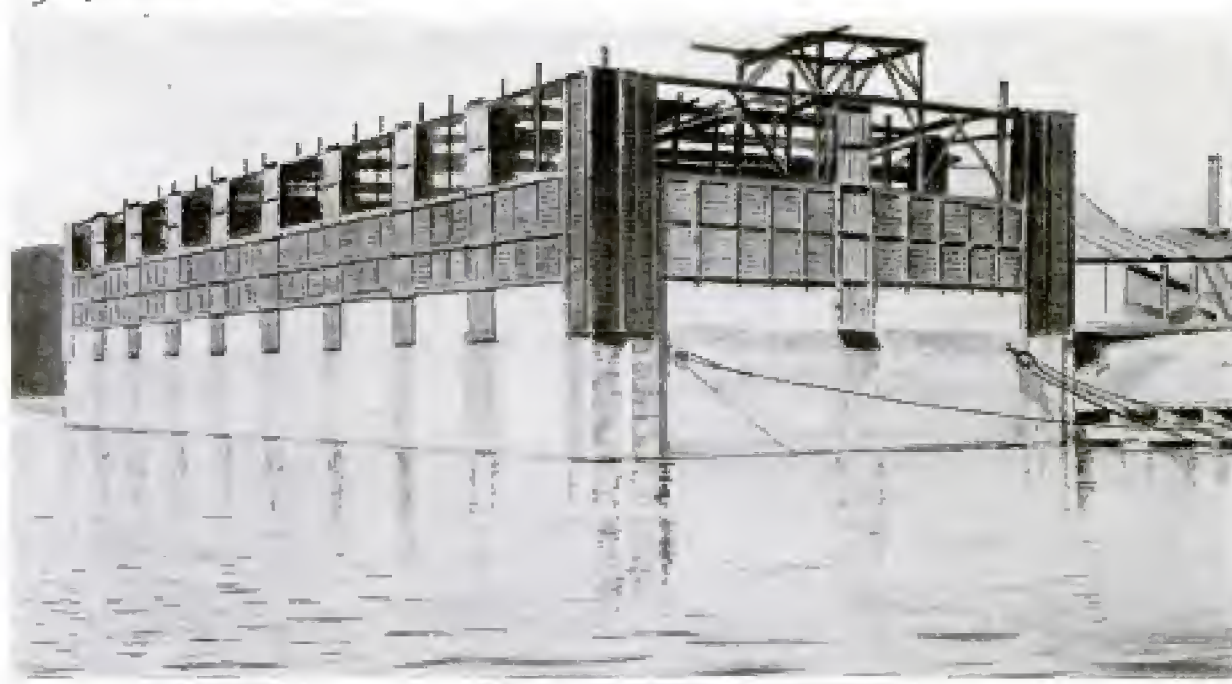
martin houses were built by members of the eighth grade, each boy contributing to the work. They were built in sections so designed that they could be readily taken apart and cleaned. Basswood was also used in this work, while the roofs of the structures were covered with heavy roofing paper. The houses were presented to the commissioners and erected in the municipal parks.

NOVEL WAY OF BUILDING AND SINKING CONCRETE CRIBS

To meet the conditions peculiar to the site, a new method of construction has been developed for building and placing the reinforced-concrete cribs that are to form the piers at the Lake Ontario end of the Welland ship canal. The piers on each side of the harbor will project about one and one-fourth miles into the lake to provide the 30-ft. depth of water necessary for lake shipping, and these piers are to be composed of cribs each 110 ft. 4 in. long, 38 ft. wide, and 34 ft. high. The bottom of the lake is hardpan, with bed-rock near the surface, putting the use of piling out of the question. The strongest construction possible is required, on account of the severe storms that sometimes sweep this end of the lake, and this condition also makes it impracticable to maintain cofferdams for building the piers in place.

Each crib is made up of reinforced-

9988



How the Diagonal Struts and Hardwood Wedges are Arranged for Holding Temporary Floor in Place

concrete walls and is divided into compartments by one longitudinal wall and eight cross walls, these compartments being open at top and bottom. For the purpose of making the crib buoyant so that it can be floated to its site, each compartment is fitted temporarily with a water-tight wooden bottom which is held in place by diagonal struts. Each pair of struts is held apart at the bottom by a horizontal beam and each strut bears at the top against the face of a recess in the concrete. A chain running over the top of the crib is attached to each beam used for holding the struts apart. After the crib is built and floated into position it is first sunk nearly to a bearing on the rock. This

Concrete Crib Nearing Completion, with Pontoon Used in Construction Work Removed

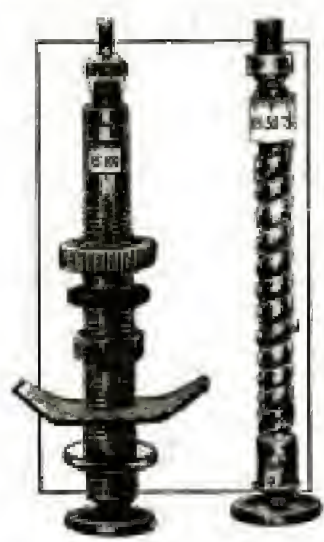
is done by filling the compartments with water let in through sea valves, the end compartments being used for balancing the crib as it sinks. The beams are then pulled loose by means of the chains and the entire floor structure is thrust in by the pressure of the water and floats to the surface, so that the crib settles under its own weight to a bearing on the rock. The compartments are then filled with earth and the crib is ready for use.

The cribs are built on pontoons and the method of building them is as interesting as that of getting them into place. Each pontoon consists of a buoyant bottom on which are mounted detachable sides and ends that serve as forms for molding the side and end walls of the crib, and between these the forms for the intermediate walls are erected. The sides and ends are held to the bottom by wedges and bolts. When the crib is completed these are detached, the bottom of the pontoon is sunk away from the crib by being loaded with scrap iron, and the crib is floated clear. The sides and ends are then recovered and mounted on the pontoon ready for the next crib.

*Inventor: Eugene M. Giles (Pat. Att'y)
Haltom 206 Woolner Bldg.
P.O. Box 10, S. 9/30, 5
388 10/9/15*

**NEW TIRE TESTER THAT IS
ALWAYS IN PLACE**

A new timesaver for motorists is an indicator that does away with the necessity for employing the usual tire



tester when the air pressure in the tire is to be measured. This indicator forms part of the valve stem and, like the ordinary valve stem, is provided with a dust cap. Inside the stem is a hollow coiled spring having one end fixed to the rim and the hollow space connected

with the interior of the tire. With this arrangement the interior of the spring receives the same air pressure as the interior of the tire. The oppo-

site end of the spring is free to move and carries a drum scale graduated for different air pressures. Pressure within the spring expands it and causes it to uncoil, with the result that the scale turns to the right position for indicating the pressure. When the pressure is to be read the scale is exposed simply by removing the dust cap.

**INTERESTING REPAIRS MADE
ON DAMAGED STEAMER**

Repairs of an unusual character have lately been completed at Seattle on the British steamship "Epsom," which went on the rocks in the Strait of Magellan during a severe storm late last summer. In grounding, a large hole was torn in the steel hull at the bow of the vessel. The merchantman was finally floated by salvage boats and towed to Punta Arenas, where it was found that proper facilities were lacking for making the needed repairs. In order for the ship to put to sea, however, several tons of cement was poured in the forward part of its hull to seal the punctures. Upon its arrival at Seattle, the "Epsom" was placed in dry dock, and the cement-filled section of the bottom was removed. This great piece of steel and cement weighed approximately 250 tons, and because of its uselessness was sunk in deep water. The damaged part of the vessel was then rebuilt at considerable expense and the ship again placed in service.



Bow of the "Epsom" After the Cement-Filled Section of Its Hull was Removed
Seattle Construction & Dry Dock Co.

MODEL SHOWS PANAMA CANAL IN OPERATION

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Sight-Seers at the Panama-Pacific Exposition Hear Phonographic Lectures
on Canal and View Great Engineering Feat from Moving Platform

* *D. S. Rockwell, Berkeley, Calif.*

BY means of a model that represents its big original so faithfully that even such details as the shanties built for the watchmen are accurately shown, it is possible for visitors at the Panama-Pacific Exposition to obtain as comprehensive a view of the Panama Canal as can be obtained from an inspection of the canal itself. The locks, lakes, Gaillard cut, the buoys that mark the channel, and other features, big and little, are shown exactly as they are, while through the canal move ships that are accurate miniatures of real ships. A hundred of these little ships, including every kind of seagoing vessel, are used in producing a remarkable illusion of the real canal and the real ships that pass through it. The Panama Railroad is shown, and over it run miniature trains that are electrically propelled but apparently run under their own power. The topography of the Canal Zone is faithfully duplicated, the model having been made from plans, topographical maps, and profiles furnished by the United States government. Even the tropical foliage is accurately represented. All that is required of the spectator is to take his place on the moving platform that encircles the model and place to his ears the telephone receivers that are provided for each of the seats. As the platform moves around the model a complete view, accompanied by a phonographic lecture explaining the features, is given of the canal in operation.

The model is a relief map made in the form of a band extending around an oval inclosure. It is made on a scale of 1 to 600, 1 ft. on the model corresponding to 600 ft. on the real canal. It is 575 ft. long and 340 ft. wide, and was built at a cost of \$300,000. Hung around the inner edge of the model is a canvas panorama that extends the view and shows the land and sea as far as the eye can reach. The lower edge of this canvas merges

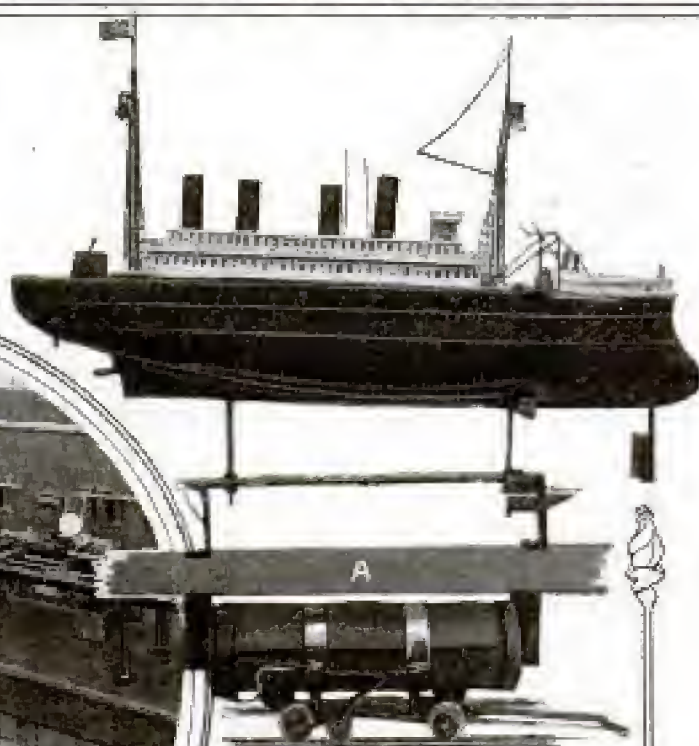
into the model in such a way that a practically perfect illusion of distance is given. The moving platform operates around the outside of the model and is about 20 ft. above it. The model is divided into 15 zones, and as the spectator is carried past the successive zones he sees the canal in operation just as he would see it in making a trip from the Pacific terminus to Colon. At night every lighthouse, buoy, ship, station, and city is brilliantly lighted by miniature electric lamps of various colors. The moving platform is 1,447 ft. in length, is capable of carrying more than 1,200 persons, and travels at the rate of 47 ft. a minute. It is driven by electric motors through silent gears that mesh in a common rack, and is made up of 48 sections, each consisting of three cars. Each three-car section constitutes a unit for the operation of the phonographs. Each car is equipped with two rows of opera chairs.

In arranging the phonographic apparatus so that the lecture will correspond exactly with the speed of the platform and with the scenes viewed by the persons seated on it, a remarkable series of inventions and clever applications of telephonic and phonographic principles were used. Of the 48 three-car sections composing the platform three are always in the loading zone, the remaining 45 sections being distributed among the 15 zones of the model. There are three phonographs in operation and one held in reserve for each zone of the model. Since there are always three sections of the platform in the viewing space of one of the zones of the model, each section is served individually by one of the phonographs operating for that zone. The lecture is divided into 15 parts, corresponding to the 15 zones of the model, and each set of four machines, including the one held in reserve, carries the same record. As a section of the platform enters a zone the corresponding phonograph starts

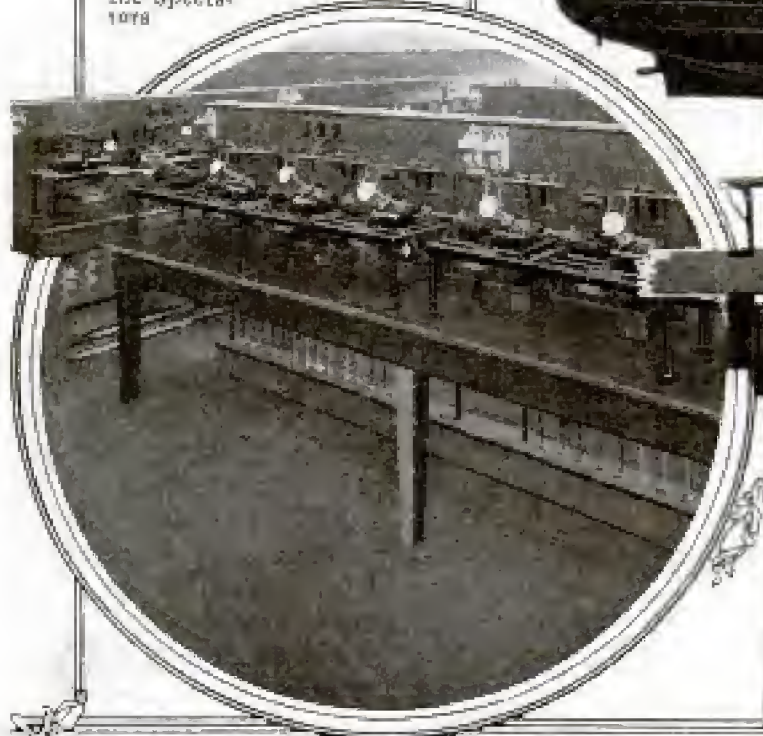


A Corner of the Phonograph Room is Shown Below. The Set for Each Zone of the Model Contains Four Phonographs, of Which Three Are Constantly in Operation and One is Held in Reserve. The Lecture is Transmitted through Wires, Highly Polished Steel Rails, and Contact Shoes Carried on the Moving Platform to the Telephone Receivers Worn by the Spectators.

1918



The Traveling Magnet Exerts Its Force through Two Arms, One Suspended from the Bow of the Miniature Ship and the Other from the Stern. The Strip A Represents the Water and Thin Flooring between the Arms and Magnet. For Towing through the Locks, Rings Attached to the Electric Locomotives are Slipped over the Hooks at the Bow.



PHOTOS BY D. E. ROCKWELL



This Picture Shows How the Spectators are Enabled to See the Entire Panama Canal in Operation as the Moving Platform Travels from Zone to Zone of the Model, and to Hear a Phonographic Lecture Describing the Different Features. The View Shown Is of the Gatun Locks, with the Electric Locomotives in Operation on the Miniature Lock Walls. The Line beyond the Locks Is the Panama Railroad



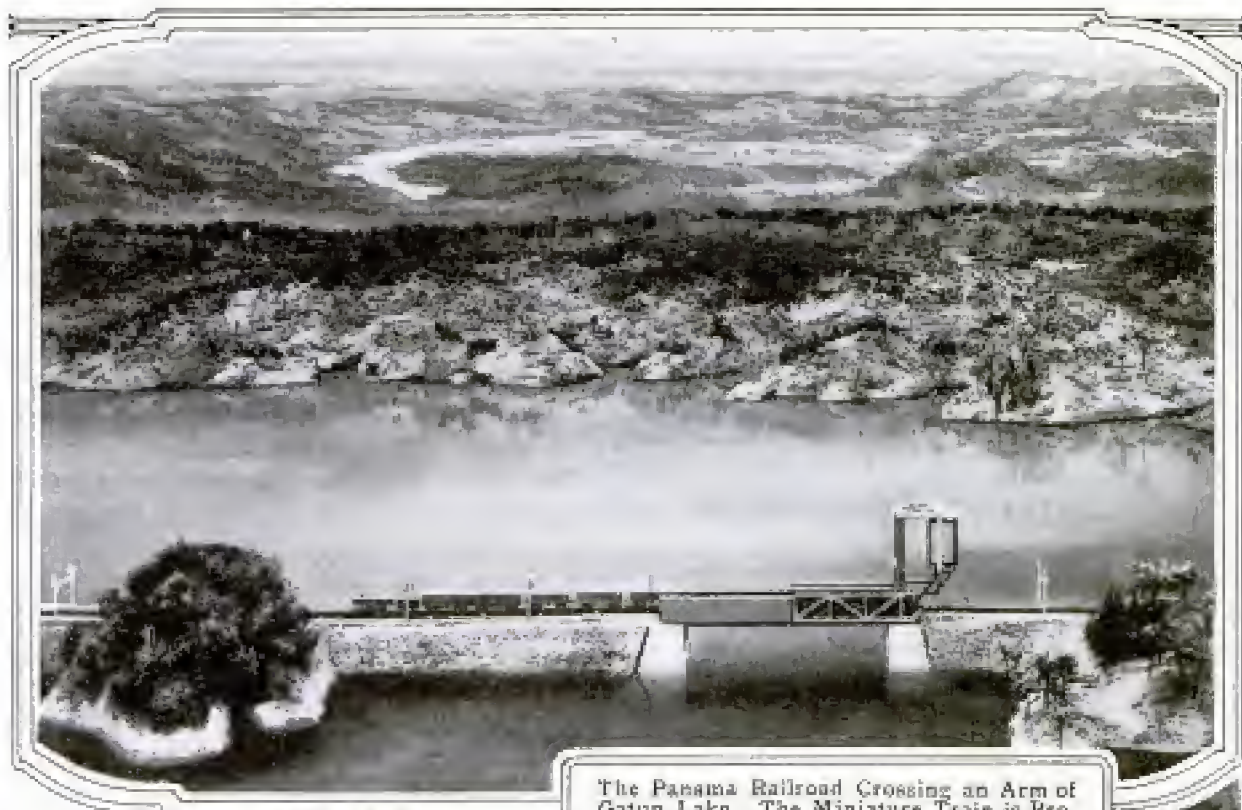
The City of Colon with Gatun Locks and Lake in the Background. At the Left of the Locks is Shown the Panama Railroad as It Mounts from Sea Level to the Level of the Lake. This View of the Model and Panorama Canvas Gives an Excellent Idea of the Topography of the Canal Zone

automatically and gives a lecture describing the different features as they are passed. When the section reaches the end of this zone the phonograph stops automatically and as the section enters the next zone the lecture is taken up by the corresponding phonograph for that zone.

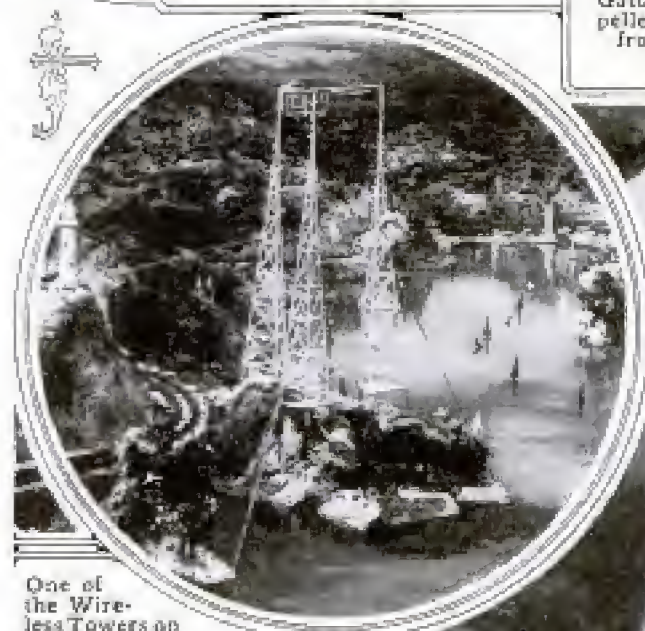
The phonographs are all installed in a central station. Each machine delivers its part of the lecture into a telephone transmitter, which in turn transmits it through a series of wires, contact rails, and other devices to the telephone receivers held to the ears of the spectators. The most interesting feature of the installation is the method of connecting the wires leading from the phonographs to the telephone equipment on the moving platform. This is accomplished by cast-iron contact shoes that slide on insulated steel rails. These rails are made of steel for the reason that this material takes a hard, glazed surface so that all scraping sounds are eliminated. Heretofore it has been thought that steel was not a good material for the electrical transmission of sound, and its successful use for this purpose is a decided innovation. The contact rails are broken at each zone division, each rail serving for only one zone. In each zone there are six contact rails in addition to a rail that takes the return current from all the contact rails. Three of these rails are each 3 ft. in length, while the remaining three extend the full length of the zone, there being one short and one long rail for each section of the platform. The short rails start the phonograph motors while the telephone transmission is through the long rails. The mode of operation is exceedingly simple. As soon as a section of the platform is loaded it passes immediately to the first zone for viewing the model. As it enters this zone the shoes at the front of the section come in contact with one of the short rails, closing a low-voltage current in which is a sensitive relay. This energizes and in turn closes a locking contact which causes the current to flow through the winding of a stronger relay having

large contact surfaces. Through the action of this relay a 110-volt direct current is passed through the motor of the corresponding phonograph, causing it to start operating. The length of each record corresponds to the zone with which it is associated, and so carefully is the timing regulated that the lecture is completed the instant the section reaches the end of the zone. At this point a switch automatically opens, the power is shut off, and the phonograph stops. The phonograph is then ready to start repeating the lecture for the third section following the one just served the instant it enters the zone, the two intervening sections being each connected with one of the other two phonographs operating for this zone. With this arrangement a phonograph is waiting for each section of the platform as it enters any zone.

Through the action of an intricate electrical apparatus, the canal and its accessories, as well as the trains of the Panama Railroad, are operated with the precision of clockwork. The miniature boats move as if under their own power, the lock gates open and close at just the right instants, and the water levels in the lock chambers rise and lower slowly—all in accurate imitation of the operation of the real canal. The boats are drawn about the harbor and through the canal up to each set of locks by magnets mounted on cars that travel underneath the floor of the model. Each of these cars is electrically and automatically operated, running on a track that follows the route through the harbor and along the canal except at the locks, where a detour is made in each case. The detour is made in order to break the magnetic connection so that the boat can be taken through the locks by electric locomotives that are accurate miniatures of the powerful electric locomotives used for this work on the real canal. As the boat approaches the lock a ring attached to the electric locomotive is slipped over a wire hook carried on the bow of the boat. The locomotive then tows the boat through from lock chamber to lock chamber until the set of



The Panama Railroad Crossing an Arm of Gatun Lake. The Miniature Train is Propelled by a Motor That Takes Its Current from the Rails. The Train Apparently Operates under Its Own Power



One of the Wire-less Towers on the Canal Zone, with a Lighthouse at the Left. When the Model Is in Operation This and the Other Towers are Constantly Flashing Their Messages in Imitation of the Operation of the Real Wireless Towers on the Canal Zone

The Rings Attached to the Towing Locomotives are Automatically Placed over the Hooks on the Bow of a Ship by Submerged Rods That are Thrust Up from the Water at the Required Time. These Rods are Shown Projecting from the Water at the Entrance to the Right-Hand Lock Chamber



locks has been passed, when the ring is automatically slipped from the hook and the boat is again taken under control by the car, which by this time has completed its detour.

For supplying the current for its lights at night each boat is equipped with a tiny storage battery, and at the

end of each trip it is necessary to give this battery a boosting charge. For this purpose the boat is drawn out of sight behind an island where flexible brushes with which it is equipped come in contact with a charged rail, and in a few minutes the boat emerges into view with its battery charged.

NEW TYPE OF BUILDING

9919 QUICKLY ERECTED

Trussed Concrete Steel Co., Detroit, Mich.
By means of a new system of construction, it has just been announced by a leading manufacturer it is possible to erect small steel-frame buildings as rapidly and easily as wooden buildings

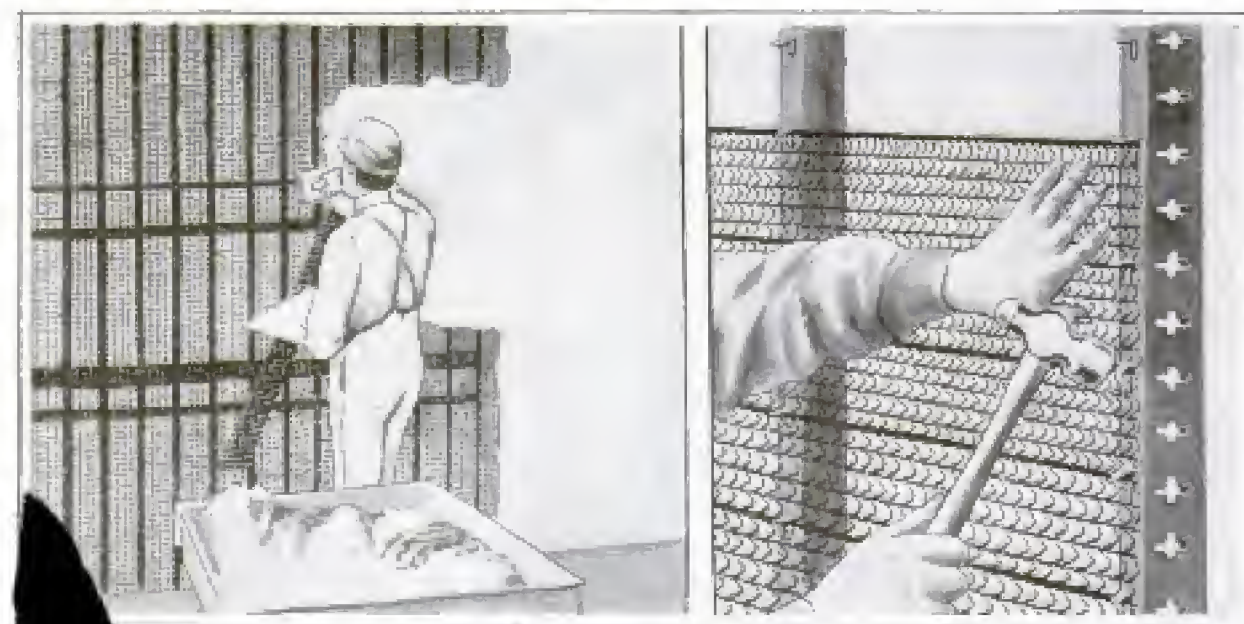
and to make them both permanent and fireproof. The construction for any case includes a variety of beams, channels, joists, rafters, and plates, all made of pressed steel and shaped to an exact fit, so that the frame goes together without

the necessity for any alterations at the building site. No riveting or bolting

is required, the joining of the different parts being made in all cases by means of tenon angles, mortises, and wedges. The wall struts and floor beams carry projecting prongs and over these the sheets of specially made metal lathing are fitted, the lathing being secured in place by bending down the prongs. Over the lathing, plastering or concrete stucco is then laid as required. The only tool needed for erecting the frame and placing the lathing is a hammer.

9190 LONG BELT CONVEYOR FOR DAM CONSTRUCTION

In the construction of the dam for the Truckee-Carson irrigation project, two belt-conveyor systems of unusual size are in use for delivering materials to the dam site, one system being used for handling concrete materials, and the other for handling the earth of which the main portion of the dam is



Lathing is Laid over Sheets of Specially Made Metal Lathing, Which are Secured in Place by Means of Prongs Carried on the Wall Struts

Albert Oscar 6109 Rochester Ar. Chgo.
one photo from Reclamation Service.

9190

composed. One of the belt conveyors, that for handling earth, is 925 ft. long and delivers the material at a central distributing station on the dam site. Both systems are operated by power from the Truckee River. The dam is to be 1,300 ft. long, with a maximum



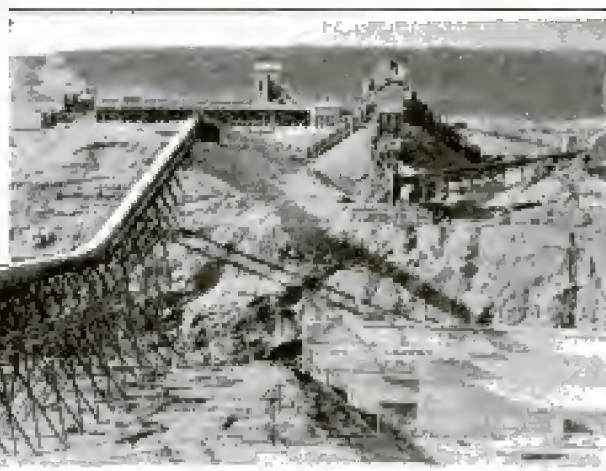
Belt Conveyor, 925 Feet Long, Used for Delivering Earth to the Truckee-Carson Dam Site

height of 124 ft., and is being built of earth held in place by concrete toe walls which go down to a depth of 50 ft. below the surface to prevent the possibility of seepage. The work calls for 200,000 cu. yd. of concrete and about 1,500,000 cu. yd. of fill, besides a large amount of excavation. The lake formed by the dam will be 40 square miles in area and is designed to supply irrigation for about 200,000 acres of land.

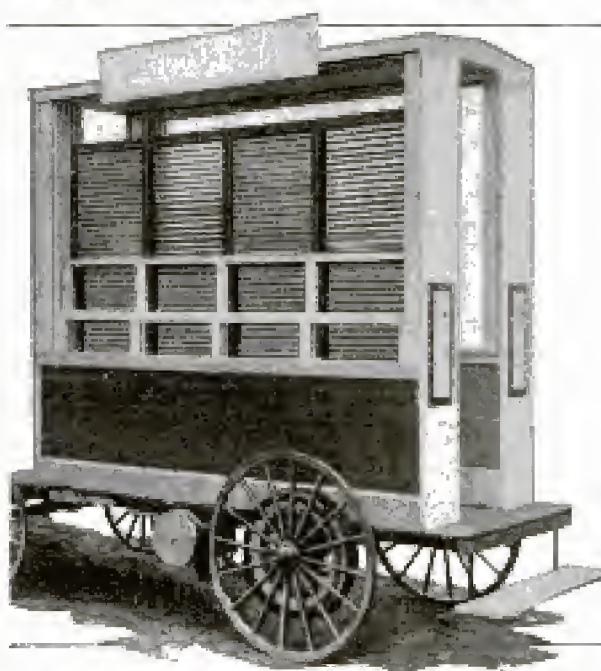
9881

SLEEPING-PORCH EQUIPMENT DISPLAYED IN NOVEL WAY

A novel means for advertising his wares, used by a maker of equipment for sleeping porches, consists of windows and blinds mounted on a light wagon and arranged to move up and down automatically as the wagon moves forward. The sash are hung on cords that work over pulleys and are counterweighted in the usual way,



the weights being sufficiently heavy to pull the sash to the top of the frame unaided. Each sash is connected by a band with a pulley mounted on a shaft running crosswise of the car, and the end of this shaft is connected by a steel band with a large pulley mounted on one of the rear wheels of the wagon. When the sash are at the top of the frame this band acts as a friction clutch on the large pulley, and the sash are pulled down. When the sash reach the bottom of the casement an automatic trip device releases the clutch of the band on the pulley and the sash are drawn back to the top by the weights, this process being repeated as long as the wagon moves forward.



With This Device for Displaying Equipment for Sleeping Porches, the Sash Move Up and Down Automatically As the Wagon Moves Forward

Wendelken Mfg Co.
Marietta, O.

9960 ARTISTIC TABLE LAMP
MADE OF LEATHER

At an electric table-light display, recently held in New York and participated in by a number of prominent de-



Beautifully Tooled Leather Gives This Lamp a Very Pleasing Effect

signers, especial interest was manifested in a lamp trimmed in tooled, hand-painted leather. Its lines are particularly pleasing and its work artistic, while the general effect of it is unusual and of a harmony which endures. The shade is made of a prepared parchment

and leather, and leather is also used in the decorative work on the base. The exhibit was the result of an attempt which was made to display in one collection the lamps of various makers.

130

PECULIAR PHENOMENA NOTED

IN NEW PLATING PROCESS,
Science and Art Vol. V, 3-8,

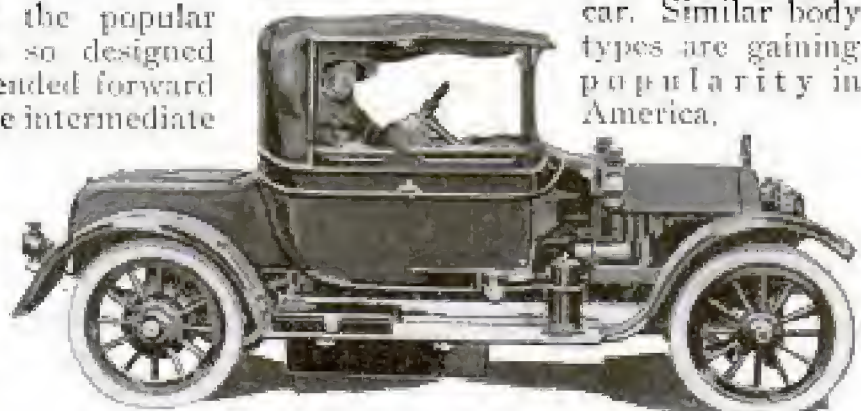
Attention has been attracted to some of the peculiar conditions met in the use of a new plating process, previously described in this magazine, by which metal is shot in the form of spray from a small gun onto the surface to be coated. It has been noted that while the temperature at the focus point of the spray sometimes reaches 2,000° F., inflammable materials may nevertheless be placed from three to five inches from the apex of this cone and covered with the metal without being ignited. For instance, it is asserted that the head of a match, as well as tissue paper, has been treated in this manner without being burned. Silk also has been metal coated and its texture not injured.

¶The largest contribution so far made to the national aeroplane fund promoted by the Aero Club of America is a \$2,500 flying boat, the gift of one of the leading aeroplane manufacturers.

7670 MIDDLE SUPPORTS OF MOTOR
TOP ELIMINATED

A motor-car top of the popular coupé-landaulet type is so designed that the top may be extended forward to the windshield with the intermediate posts completely out of view when the windows are down. This gives the driver of the machine an unobstructed side view. When the windows are not in use they slide between the double walls of the car body, while the pillars,

which hold them in place, fold out of the way. The top may be folded back and the machine used as an open car. Similar body types are gaining popularity in America.



A Newly Designed English Coupé-Landaulet Which Provides Its Occupants an Unobstructed Side View

COURTESY ILLUSTRATED LONDON NEWS

Body was invented & built by
Mr. Conway Jenkins
175 Piccadilly,
London.

WATCH MOVEMENTS SHOWN IN MOTION-PICTURE FILMS

Motion-picture films are being successfully used in a school in Kansas City, Mo., for illustrating the proper

RICHLY CARVED BURL TABLE MADE WITH POCKETKNIFE

As an example of what can be accomplished with the plainest of tools when they are in the hands of a skilled work-



From Left to Right These Films Show: A Delicate Job of Filing; Mechanism beneath Dial of Repeater of "Gooseneck" Type; Mounting a Jewel; Bell and Hammer Mechanism of a Repeater or Striking Watch

methods of watch repairing and engraving, and for showing complicated watch mechanisms in action. In this way the students are enabled to understand the most complicated movements with little or no difficulty. The pictures are greatly enlarged, a jewel, for example, which is only about $\frac{1}{16}$ in. in diameter, showing up on the screen as over a foot and a half in diameter. One repeating watch, having about 30 different levers and as many different actions, was photographed. When the pictures were thrown on the screen and the machine turned slowly, every action in this complicated watch was demonstrated to the students.

man, a very ornate table made of richly carved redwood burl, madrone root, and other woods of the Pacific coast, and valued at approximately \$5,000, has recently been made by a Californian with the aid of a jackknife. It is built up of 832 separate pieces, all of which are detachable and so numbered that the article may be taken apart and re-assembled if it is desired. Its design is unusual, as are also its carvings, which are of a variety of characters. The round top of the table is 3 ft. in diameter and made from a solid piece of burl, while about its circumference and suspended beneath it is a wealth of decorative work carved from madrone

9866 # Mrs. Bertha Snow Adams,
1500 Wilson Circle
Santa Cruz, Calif.

root and other woods. Alternating with a series of carved shade and socket mountings for small incandescent globes are double storks and vases, the



Various Woods were Used in Making the Table, Which is Composed of 832 Separate Pieces, Each Detachable

latter resting on the heads of various water animals. In addition to these there are nearly 30 Egyptian heads fitted in different places, while a wooden chain, held by serpent heads, is festooned about the table. About the center post and base are numerous other objects carved from different woods. Some of these are grotesque images, queer animals, alligators, and heads of various kinds. Much of the work is also enriched with jewels and brilliants. There is not a piece of mill-work represented in the table, which consumed nearly four years' time in its building.

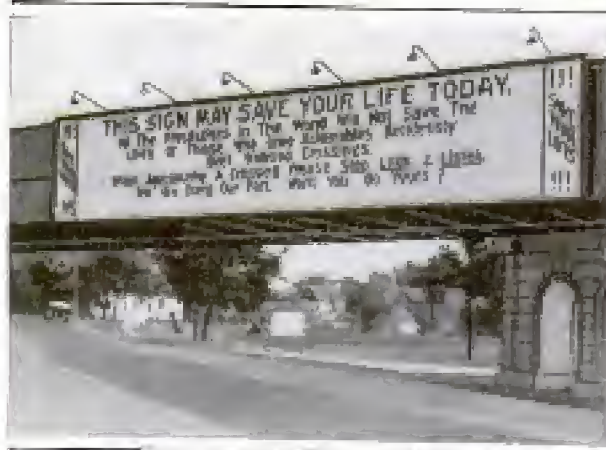
TO MARKET CARP FROM THE SALTON SEA

For years carp in great numbers have inhabited the waters of the Salton Sea, a lake located below sea level in southern California and formed and maintained by overflows from the Colorado River. The lake has been diminishing through evaporation while the carp have multiplied enormously, and it is now a common saying that the waters of the lake would "assay 20 per cent carp." These fish are not regarded as edible in this country, but are valuable as a fertilizer when converted into fish scrap. A company re-

cently organized expects to take the fish from the lake at the rate of from 20 to 30 tons a day and to market them for this purpose. This is likely to spoil a favorite diversion of tourists passing over the long bridge at Salton, who have been accustomed to throw scraps of bread from the dining-car windows and watch the greedy carp congregate.

RAILWAY WARNS MOTORISTS TO SAVE THEIR LIVES

In an endeavor to lessen the number of accidents at its grade crossings, many of which have been directly due to careless driving on the part of motor tourists, an eastern railway company is now engaged in a comprehensive "safety-first" campaign to impress and constantly remind chauffeurs of the vital necessity of exercising care instead of trusting blindly to luck. One of the ways in which this is being done is by the erection of signs 50 ft. in length and 10 ft. high, admonishing motorists to save their lives. While doing what it can to prevent the constantly recurring tragedies, the railroad attempts in this way to obtain the co-operation of the public. Although in the last 10 years this company has abolished 300 of its grade crossings,



This Sign over Broadway at Flushing, Long Island, may be Readily Seen by Motorists both Day and Night

the rapid increase in the number of motor cars has kept the fatality list constantly swelling, in spite of everything that has been done to lessen it.

W. D. Goodwin, 627 West 124 Street.

Southern Pacific
Bulletin
San Francisco

WOODEN CANTILEVER USED IN BUILDING VIADUCT

In constructing a railway viaduct at Lewiston, Mont., a wooden cantilever traveler which was used for handling the steelwork offers an interesting example of modern engineering methods. Except for the supporting guy rods, reaching from the center tower to the outer end of the long overhang, the traveler was built entirely of timber. The heavy horizontal beams were about 20 ft. above the track, and, with the two derrick booms which they supported at their outer ends, commanded a reach of approximately 110 ft. in advance of the finished work. These beams extended about the same distance to the rear that they did forward and held a platform on which the hoisting engines were carried. This provided the traveler with an adequate counterweight. The material was delivered in cars

swung out, as may be seen in the accompanying photograph. In this manner the booms were used in building up the bridge towers and putting the short girders in place. The connecting members were swung into posi-



The Wooden Cantilever Traveler in Use Beginning the Erection of the Viaduct

at the end of the track, carried through the lower part of the traveler and

tion by tackles attached to the overhang structure.

SPRINKLER AND FLUSHER FOR STREET CLEANING

With the idea of eliminating all but a small percentage of the handwork ordinarily required in street cleaning a gasoline truck equipped with flushing and sprinkling apparatus has been developed and is now being introduced in some of the principal cities. The apparatus is made in two sizes, one being mounted on a 6½-ton truck and the other on a 5-ton truck. The tank for the larger truck has a capacity of

1,500 gal. and is square in section except for a rounded top, while the pump is capable of discharging the water through the flushers at the rate of from 400 to 500 gal. a minute. The smaller truck is equipped with a tank having a capacity of 1,000 gal., with a pump capable of discharging the water at the rate of from 250 to 350 gal. a minute. In general arrangement and operation the two are practically the same. The

International Motor Co.
West End Av. & 64th St.
New York

pump is of the centrifugal type and is driven by the main propeller shaft of the truck, on which it is mounted concentrically, the pump being carried on a hollow shaft through which the propeller shaft passes. The pump is thrown into and out of gear with the propeller shaft by means of a dog clutch. In front of each front wheel is a flusher head which is so placed that it is in plain view of the driver. Each flusher head is connected with the supply pipe by a swivel joint and can be made to discharge in any direction, this feature making it possible to flush both sides of the street at once or to concentrate both streams on one point with equal facility. In front of each flusher head is a sprinkler head consisting of a bronze cup mounted in upright position at the lower end of a vertical pipe. As the water, discharged from the pipe above, hits the head, it is thrown upward in a cup-shaped spray having an angle of about 30° each way

from the vertical. By means of a three-way valve the water is made to discharge through the flusher heads or the sprinkler heads as required. The control for all these operations is from the dash. With either machine it is possible to flush practically all the refuse from the street into the sewer, leaving little "brooming" to be done by the street cleaners.

RESIDENCE PORCH WITH TERRACE GARDEN

An elevated garden in the form of a low terrace built against the front of the porch is one of the novel and attractive features of a residence recently completed in southern California. After the house and porch had been finished the owner built, at slight expense, a cobblestone wall to inclose a space about two feet wide in front of the porch and extending its full length. The wall is 3 ft. high and 1 ft.

*International Motor Company,
West End. Ave., + 64th St.,*



Flusher and
Sprinkler Heads
Mounted on Front
of Truck



The Flusher
Heads Working
under Full
Pressure



Sprinkler Heads in
Operation: The Two
Heads Together Are
Capable of Discharg-
ing 80 Gallons of
Water a Minute

This Picture
Shows the
Powerful
Stream Result-
ing from
Directing Both
Flusher Heads
to One Side
of the Street



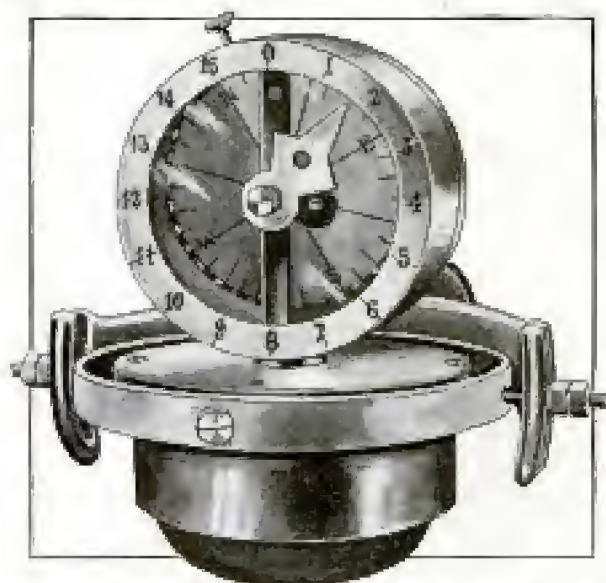
This Little Flower Garden, Elevated about Three Feet above the Ground, Is One of the Attractive Features of a Residence in Southern California

thick, and is surmounted by a cement cap, 12 in. wide and 4 in. thick. The space was filled with soil, and in this flowers were planted. At each end the wall was built in the form of a box. Each of these boxlike inclosures contains a cypress tree.

coincide with the zero, the machine is headed in the correct direction. A connection between the horizontal

FRENCH AVIATION COMPASS HAS NEW FEATURES

For aerial navigation purposes a special compass has been developed in France which is much more easily read by an airman than is the ordinary instrument and which also indicates any variation from a predetermined line of flight, instead of merely pointing northward. Properly it consists of a common compass set in an inclosed case which is surmounted by a cylinder holding two vertical dials and an indicator. The card, or inner of these dials, and the pointer move together, and the deviation of the latter from the zero mark on the outer dial shows the extent to which an aeroplane is being driven off its proper course. The outer dial is adjustable, and at the beginning of a voyage its zero point is turned to correspond with the contemplated line of flight. When the indicator and card



Vertical Compass of French Invention Designed for Use of Aerial Navigators

compass and the axis of the vertical pointer and card actuates the two latter members

For beautifying the Panama Canal Zone the government is working on extensive landscape plans and is distributing ornamental plants to residents along the line of the canal.

A. Deperdussin
19 rue de Entrepreneurs
Paris

A. Deperdussin,
19 Rue de Entrepreneurs, Paris.

International News Service, 238 William St. N.Y.C.

999 Shipwreck.

DERELICT FOUND BY CUTTER IN ATLANTIC LANES



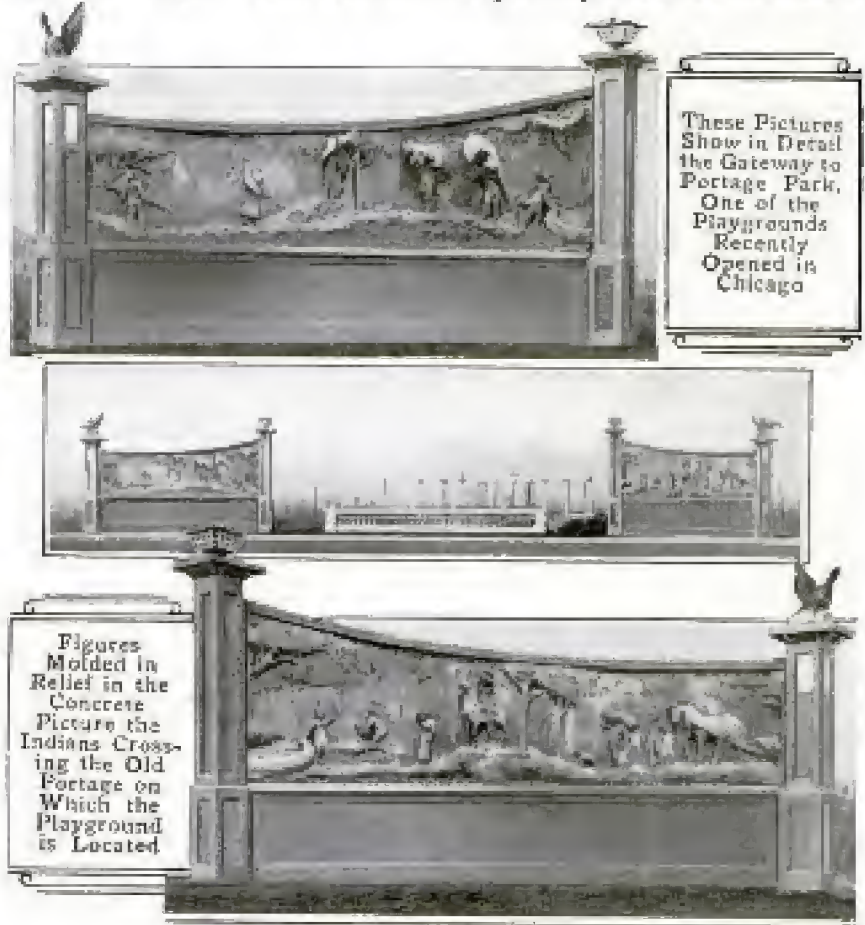
COPYRIGHT, INTERNATIONAL NEWS SERVICE

WHILE on coast-guard duty approximately 1,000 miles due east off New York, a United States revenue cutter encountered a derelict which was subsequently taken in hand and towed to Halifax. The vessel is the "William Thomas Moore," which was abandoned some time ago by its crew while 180 miles off Cape Henry. Following that the ship drifted aimlessly about and was finally carried by the currents into the main transatlantic lanes, where it was sighted.

INDIAN HISTORY DEPICTED 9780 IN CONCRETE

By using a feature of local Indian history as his "motive" and concrete as his material the designer of the structures that flank the entrance to one of the playgrounds recently opened in Chicago has not only produced a design of artistic and historical value but has demonstrated the adaptability of this material to decorative work of the highest class. The playground is known as Portage Park, taking this name because of its location on the old Indian portage trail between the Chicago and Des Plaines rivers. The figures molded in relief on the face of the concrete show the Indians carrying their children, with their canoes, wigwams, and other belongings, along the trail, just as they had

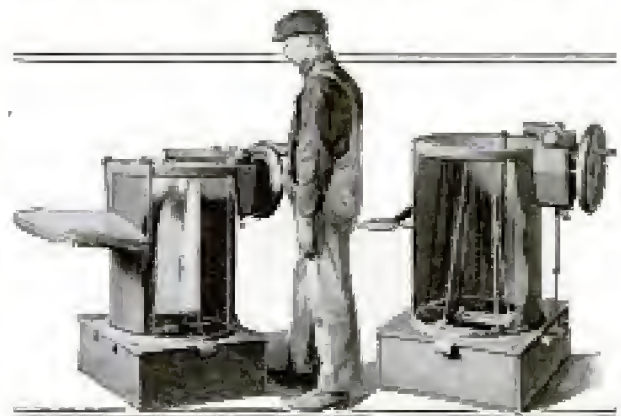
doubtless done for centuries before the white man came and transformed their wilderness into a modern city. A view through the entrance shows a low concrete balustrade occupying the center and a concrete peristyle in the distance.



BAG CLEANER SAVES CEMENT OTHERWISE WASTED

Thousands of dollars' worth of cement is wasted annually because the bags in which it is packed are not thoroughly shaken after being emptied. To eliminate this loss a bag cleaner has been invented which does the work efficiently and at less expense than it can be done by hand labor, which at best is more or less unsatisfactory. In the base of the device is a receiving drawer in which the cement is recovered. Above this is a vertical drum which incloses the beaters. These consist of two steel rods each bent to form an inverted "U" and mounted to oscillate back and forth when a sack is placed over them bottom downward and the

machine set in motion. This vibratory action thoroughly cleans a sack in a few seconds. When 50 bags are run through the machine a bell rings, thus doing away with errors in counting.



Left: Jacket Cut Away to Show Device in Operation. The Oscillating Beaters are Pictured at the Right

Century Cement Machine Co.,
Rochester, N.Y.

KEEPING A NATION'S MAIL UNDER LOCK AND KEY

112
By L. M. LAMM

*District Natl Bank Bldg
Washington, D.C.*

IT takes more than a million locks to protect the United States government's letters while in transit. The department makes and keeps in repair not only all of these locks, but all fastening devices used in the mail service. Previous to 1889 everything of this nature was furnished and repaired by contract at a great expense. In that year it was decided to repair the locks, and a small shop was installed at Washington. After experimenting a while it was found that the department could do the work not only cheaper than by contract, but better. The following year it was decided to enter into the manufacture of locks, keys, and mail-bag attachments, as it was believed it would be a great advantage to the department to have its own shop where orders could be filled more promptly and with less danger of keys getting into the hands of those not entitled to them.

From the small room equipped with one drill press and one stamping machine and employing half a dozen workmen the shop has grown until now it is a complete factory, equipped with tools and machinery necessary for the converting of sheet steel and brass and other material into locks and keys and the many other attachments that are made. Among other features, the present factory contains a press room with 14 stamping machines, a lock-finishing and assembling room, a miscellaneous room where cord fasteners are assembled and other equipment made, a department where hundreds of postal scales are repaired, and a tinning plant where all mail-bag attachments are tinned to prevent rusting.

Shortly after the shop was established a defect was found in the mail lock, and steps were taken to design a lock which could not be jarred open, with the result that the "Eagle" lock, later called the "Double Star" lock, was designed. More than 1,000,000 of these locks have been made and put into service since that time. Although

this Eagle lock has given the best service of any lock ever used on mail bags, it is now being gradually withdrawn on account of its weight, and replaced by a still later lock known as the "La," weighing only $2\frac{1}{2}$ ounces, or about one-half the weight of the Double Star and costing less than one-half as much to manufacture. As the carrying of the mails is paid for by weight, the La lock will result in a large saving to the government in transportation cost, besides which much time will be saved in the locking and unlocking. This is an important feature, especially with the railway post-office clerks, where every moment counts.

One of the most important and interesting locks in use in the postal service is the registered-mail lock, commonly called the "rotary." This lock is equipped with a registering mechanism having four dials, each numbered from 0 to 9, which indicates the number of times the lock is unlocked. Each is also provided with a serial number stamped on the outside of the case, no two bearing the same number. Pouches containing registered mail are locked with these and a record kept of both the serial number of the lock and the registered number as shown on the dials. If any lock reaches its destination showing a different number on the dials it is at once known that it has been tampered with. As each clerk who handles the pouch is required to receipt for the same, it is practically impossible to tamper with the contents of the pouch without detection. These locks were formerly made with cast cases and were purchased by the government at \$2.50 each. An improved case, which is drawn from sheet brass, has been designed by employees of the shop. It makes a lock of much neater appearance and lighter in weight, at a cost of 90 cents each. Savings such as this have been made all along the line.

A similar registered lock is also made for use between the United States, Canada, and Mexico. In this connec-

tion it may be of interest to know that the mail pouches dispatched from the United States to all other foreign countries are secured with lead and string seals instead of these locks.

The shop at Washington also manufactures and repairs all locks and keys used on street letter boxes and a great many special locks for the department. Formerly all letter boxes were locked by padlocks

making it practically certain that the collector will not fail to lock the box.

Locks and mail attachments for the Philippine Islands, Porto Rico, the Hawaiian Islands, and the Panama



The Building in Which the Government Locks are Manufactured, Improved, and Repaired



Corner of the Machine Shop Where the Lock Parts are Made

and one combination used for an entire city. If a key were lost or stolen it was necessary to withdraw all the locks in that city and replace them with others of a different combination to guard against depredations. To obviate the necessity for changing so many locks, a new one was designed in the shop to be attached to the inside of the letter-box door. This lock is capable of being set to an almost unlimited number of combinations and a different combination can be used on every collection route if desired. Another feature is that the key cannot be removed when the lock is unlocked,



PHOTO BY HARRIS & EMMET

Putting the Locks Together: An Idea of the Amount of Work Done in the Shops is Given by the Fact That the Postal Service Uses Over 1,000,000 Mail-Pouch Locks and 8,000 Registered Locks

Canal Zone mail service are also made and kept in repair by the shop. Owing to climatic conditions it is necessary to make all such equipment of nonrusting materials.

Some idea may be had of the growth of the postal service from the fact that in 1890 only 300,000 locks were needed for locking pouches; while at the present time there are over 1,000,000 used for the purpose. The number of registered locks required has increased during this period from 7,000 to 8,000.

Great quantities of attachments are made annually for use on mail bags at the shop, one of the principal articles of manufacture being cord fasteners for sacks, of which approximately 400,000 are made annually. Another device designed in the shop, which has completely changed the style of equipment and resulted in the saving of thousands of dollars to the Post Office Department in cost of transportation is the collar fastener, used for fastening the mouths of pouches. Pouches equipped with this device can be opened and closed very much quicker than the old style and are considerably less expensive to manufacture.

The shop is frequently called upon to pass on devices and design and

manufacture special articles for the post-office service. Recently a small twine holder was designed for use in post offices and railway postal cars, which permits the unwinding of twine from the outside of the ball. Heretofore the balls of twine were unwound from the inside and considerable loss of twine resulted from the ball collapsing and tangling when partially unwound. The device is quite simple and inexpensive and it is expected will result in considerable saving in twine. The saving will be better appreciated when it is known that some \$200,000 is appropriated yearly for twine used in the postal service.

The shop itself is located in a six-story building and is run on the most economical and efficient basis. It is under the direction of an official who has been in charge since its organization, and it is due to him that the new locks have been put into use. Congress has been asked to appropriate \$200,000 for a new home for this plant which has saved so much for the government.

J. E. Price, U. M. C. A. Bldg.,
INDICATOR SHOWS ACTION
Conductor P. H. R.
OF RAILROAD BRAKES

A new automatic indicator for showing the condition of the brakes on a railroad train is designed to do away with the present unreliable and somewhat dangerous method that requires the trainmen to lean out from the sides of the train at intervals and watch for the sparks that are thrown by the grinding brake shoe when a brake is "stuck." The indicator consists of a

Union Station Washington DC
 miniature semaphore placed in a case behind a glass panel so that it is easily seen, and it may be arranged to show the condition of the brakes on the whole train or on the individual car in which it is installed. When the brakes are set, the semaphore arm goes to the horizontal position, and if the brakes release properly it falls when the air is released, the semaphore being controlled by electrical contacts made by the piston of the brake cylinder. In addition to this, the indicator shows at



The Semaphore, Shown in the Center, is Electrically Operated by Contact of the Piston Bolt with the Plate above It. The Bolt is Shown Clear at the Left and in Contact with the Plate at the Right

U.S. News, Room 230, Treasury Dept., Washington, D.C.

POPULAR MECHANICS

Mfr. Frey Manufacturing Co.
1336 S. Michigan Blvd.
Chicago, Ill.

a glance whether the brakes are acting properly when the air is applied. The indicator is operated in connection with a pipe connection controlled by a valve by which sticking air valves may be "bled" without the necessity of stopping the train.

weather. The hood is made of flexible transparent material and can be rolled up and packed away when not in use.

AVENUE PARKING FESTOONED WITH CHAINS OF GREENERY

To prevent pedestrians from wearing paths in the grass, trampling ferns, and injuring small shrubs in the parking bisecting a part of Pennsylvania Avenue at Washington, D. C., heavy chains have been suspended between the trees lining both sides of the long plot. Slack has been allowed, so that midway between each pair of trees the chains nearly touch the ground. At these points sturdy vines have been



Vines are being Trained along These Chains, Suspended between Trees and Posts to Prevent Pedestrians from Cutting Paths across the Parking

planted and are being trained to grow along the fencing, so that eventually a continuous festoon of greenery will skirt the margins of the parking.

HOOD FOR PROTECTING WINDSHIELD IN WET WEATHER

A new accessory of pronounced interest to motorists is a visor or hood for use in stormy weather, designed to protect the portion of the windshield that the driver normally looks through in operating the car. It is claimed that with this hood it is possible to obtain a clear view ahead in any kind of



This Transparent Hood Prevents the Rain or Snow from Striking the Portion of the Windshield That the Driver Looks Through

At the base of the hood are five vacuum cups with which it is attached to the glass. These cups hold with sufficient force to resist any wind that a car is likely to be driven in, but the hood is easily removed by forcing the thumb nail under the cups and breaking the vacuum. A rubber sealing strip that fits tightly against the glass prevents the rain from getting in behind the hood.

FOOT LEVER REMOVES COVER OF SANITARY CUSPIDOR

Designed for sanitary reasons as well as for the sake of general appearances, a closed cuspidor is being made which is much less objectionable than many of those of ordinary types. Within its outer shell it is provided with a sliding cover which seals it except when pressure is brought to bear upon one of the small foot levers fixed at the base. When a pedal is released the cover moves back into place. The urn holds a receptacle which is easily removed and cleaned.



Mfr. Frank Sanitary Cuspidors,
8 Winter St.,
Boston, Mass.

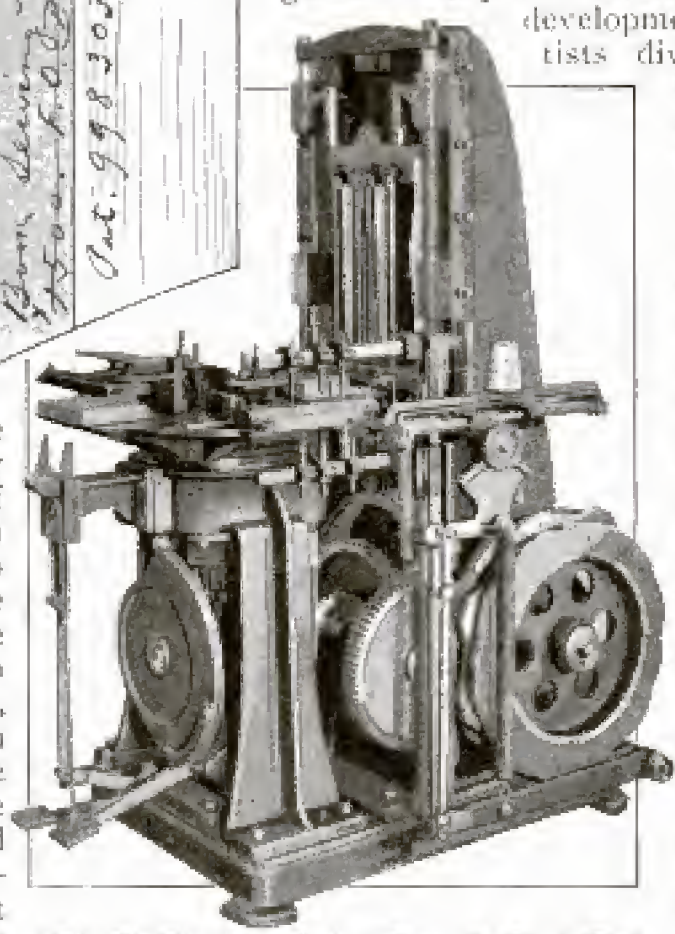
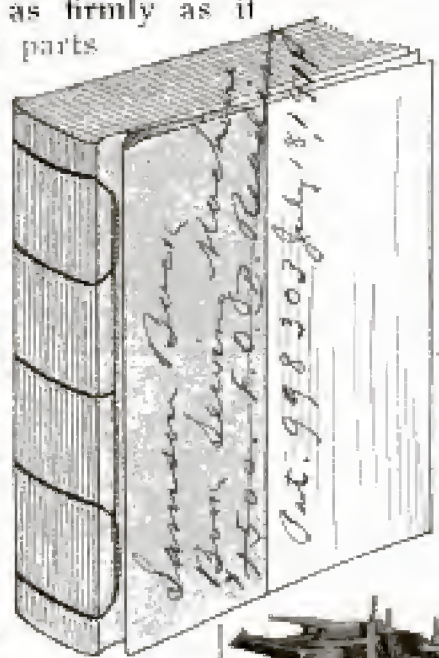
E. S. Darnington,
Weymouth Heights

Copyrighted material

The S. B. B. Machine Co.,
 67th Street Sta., Reading, Pa.
 200 5th Av., New York.
 Mr. J. H. Remington,
 90 Dexter Folder Co.,
 New York.

**MACHINE BINDS BOOKS BY
NEW METHOD**

A machine that sews the sections of books for binding in a new way is said to produce a binding of unusual strength, while by its use individual sheets and inserts may be bound into a volume as firmly as if they were parts of a folded section. Machines heretofore in use have followed the method used in hand binding, which consists in stitching each section together through the fold, and then fastening the sections together by tying the ends of the cords, after which the glue is applied to the back. With the new machine the entire volume is clamped in place, a series of cuts, about one-fourth inch deep, is sawed into the back and into these cuts a continuous cord is placed, the cord being led from cut to cut and stretched tightly by the machine. The cuts are made diagonally so that after the cord is made tight it cannot be pulled out without tearing the sheets, and after the back is glued the binding is as strong, apparently, as it is possible to make it. The machine occupies a floor space of 3 by 4 ft. It operates automatically and rapidly, being capable of turning out books at the rate of six a minute.



With This Machine a Book is Bound So Firmly That It cannot be Pulled Apart without Tearing the Sheets

**CARBON DIOXIDE IS TESTED
FOR PLANT FERTILIZATION**

Experiments recently conducted in Germany tend to indicate that it is not only technically possible, but also commercially practicable, to stimulate plant growth by carbonic-acid fertilization. This is one of the important foods which vegetable life absorbs from the atmosphere, which normally contains approximately three-hundredths of one per cent of this gas.

In making their study of the feasibility of increasing the proportion of gas artificially in order to hasten plant development, the scientists divided a hot-

house with an air-tight partition into two compartments. Ornamental foliage plants of a like character, size, and number were set out in each of the glass rooms. These places were maintained at equal temperature and degree of moisture. In one space carbonic-acid gas was introduced in quantities sufficient to raise the

atmospheric content to between .35 and .45 of one per cent, while in the other only normal air was supplied.

It was found that the plants subjected to an excess of gas thrived remarkably. Subsequent tests made on a larger scale prompted the conclusion that this method of fertilization would be profitable if followed by commercial growers.

Dexter Folder Company
 200 Fifth Av., New York.

Letter recd 12/2/15 from above office signed by Jack H. Copyrighted material

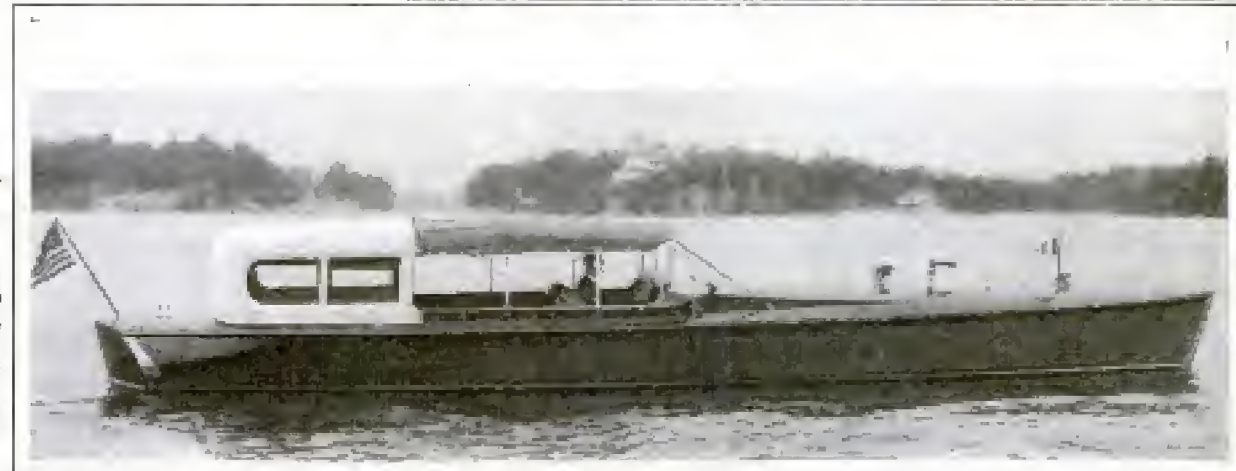
8602

**MOTORBOAT FINISHED LIKE
AUTOMOBILE**

A motorboat brought out by an eastern maker is equipped and finished as elegantly as the most up-to-date automobile. The cockpit is provided with



The Driver of This Motorboat is Protected by a Standard Windshield; the Cockpit is Finished and Furnished Like an Automobile



The Back of the Cockpit is Inclosed by a Top Like That of a Limousine, at the Front of Which is a Collapsible Awning That Pulls Forward so That the Entire Cockpit can be Covered

upholstered seats and is inclosed at the back with a top like that of a limousine. At the front of the top is a collapsible awning that pulls forward so that the entire cockpit can be covered if desired. The boat is steered by an automobile wheel, while the "driver" is protected by a standard windshield.

Plans are being promoted in Canada for a concrete highway, similar to the Lincoln Highway, to extend from Winnipeg to Calgary, a distance of about 800 miles.

**USING CARBON MONOXIDE TO
FIGHT BUBONIC PLAGUE**

The latest method of fighting bubonic plague, now being tested by the health officers of the United States government, consists in thoroughly fumigating every part of the interior of a ship with carbon monoxide, the gas that constitutes the deadly "white damp" of the coal mines. In this work

carbon monoxide possesses several advantages over the hydrocyanic acid and other gases heretofore used. It is a product of incomplete combustion and can be readily made on the revenue cutter as needed, and since it is heavier than air it settles to the lowest sections of the hold. Bubonic plague, like yellow fever, typhus fever, and some other diseases, can only be transmitted by a carrier. The carrier for bubonic plague is the flea, and the disease is spread almost exclusively by the fleas carried on rats that infest the holds of ships.

Built by: Hutchinson Bros.,
Alexandria Bay, N.Y.

Motor Boat Oct 10, 1914

Clipping from: The Engineer

Public Health Reports, Vol. 29, No. 58. Sourced by U.S. Health Service.



Pumping Carbon Monoxide into the Hold of a Ship to Destroy the Rats and Fleas That Carry Bubonic Plague

When a ship is thoroughly fumigated with carbon monoxide the rats and fleas are killed and all danger of the spread of the infection from that particular ship is eliminated. When a ship is to be fumigated, pipes are led from the revenue cutter into the hold and the hatches and all other openings are tightly closed. The gas is then pumped in until it has penetrated every crevice.

¶The cost of photo-engravings has advanced about 200 per cent since the outbreak of the war.

MOTOR TRACTORS ARE USED AS SWITCH ENGINES.

Electric motor trucks are being made to do the work of railway switch engines in the yards of an industrial plant at Fort Wayne, Ind. Approximately a half mile of private trackage is maintained by the company, and in moving loaded as well as empty freight cars it has been found that the work can be done satisfactorily and at low expense by employing motor tractors, instead of depending upon outside



This Motor Truck Hauls as Many as Seven Freight Cars at a Time When Used for Switching Purposes

C. F. Edholm,
1353 West 36th Place,
Los Angeles, Calif.

switching facilities. Two five-ton trucks are used for this purpose. In both instances the driving power is applied to all four wheels of the machine.

9984 —
**GOVERNMENT EXPERTS STUDY
 ERUPTION OF MT. LASSEN**

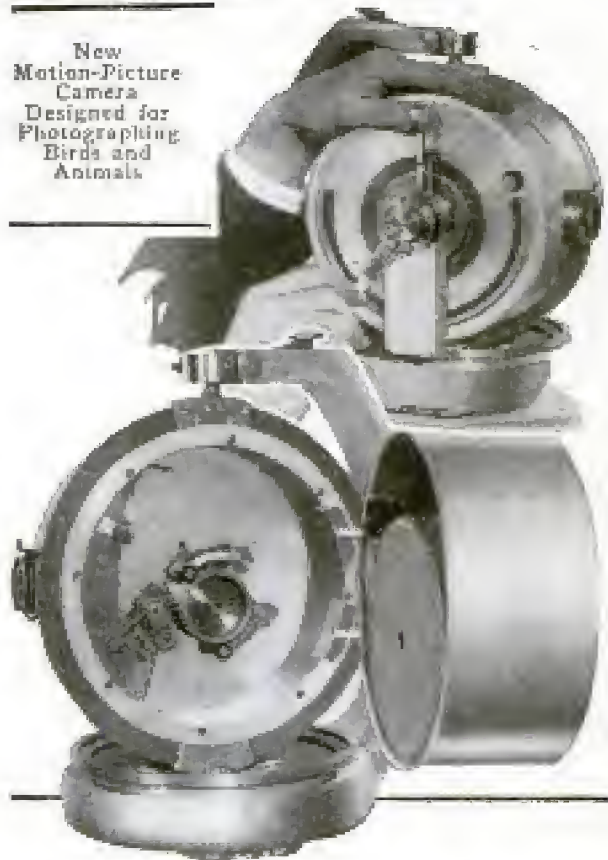
Scientific study of the eruption of Mt. Lassen in California is being conducted jointly by the Geological Survey and Forest Service. Continuous observation of the volcano's activity was made by forest rangers from a fire lookout tower on Brokeoff Mountain, near the crater, following instructions from Washington and prior to the arrival of the scientists. This information is being used as the basis of the investigation, which it is hoped may result in new disclosures regarding disturbances of this nature. A government geologist, who made a study of the volcano during its series of eruptions a year ago and who is identified with the present inquiry, has advanced a tentative theory that this latest disturbance was caused by flood water from melting snow flowing into the crater. The tremendous steam pressure resulting from this, he believes, may have caused the river of mud to burst forth from the mountain. A bright glow which appeared against the great clouds of smoke and steam issuing from the crater, he thinks, was a reflection from molten matter uncovered by the explosions.

9951 —
**MOTION-PICTURE CAMERA FOR
 NATURE PHOTOGRAPHY**

For the benefit of the nature photographer who after cautiously approaching a bird or animal is often unable to get a picture because his camera cannot be adjusted quickly enough, a new motion-picture camera has been invented which is suspended from an aluminum frame in such a way that it levels itself from its own weight almost instantly. This camera is strong and light, weighing about 20 lb. The

camera and tripod head are formed in a single unit and may be placed on a rock or stump and the tripod disre-

New
 Motion-Picture
 Camera
 Designed for
 Photographing
 Birds and
 Animals



garded. A motor device is provided which may be attached to the camera so that the instrument may be held in the hand when it is impossible to obtain a proper support. An important feature of the camera is a panoramic arrangement which allows it to be swung in any direction with steadiness and uniformity of speed and to take pictures straight up or straight down if desired. A special gate behind the lens keeps the film from being touched during its passage from the dispensing to the receiving retort, a feature that prevents the film from being scratched by dust or other substances.

A 34-ft. concrete dam recently built in Tennessee has been constructed so it can be raised to 65 ft. without draining the reservoir. A wide strip of lead set edgewise along the crest is to make the joint between the old and new parts water-tight.

Inventor: Carl E.keley
 American Museum of Nat. History
 Ckeley Camera, Inc. - New York

ADJUSTABLE STILTS MADE WITH ANTISKID SHOES

Stilts with stirrups that may be adjusted to different heights to suit the various whims of their youthful users are made with rubber shoe pieces on the bottom of the sticks to prevent slipping. The foothold is made of steel and hinged at the bottom to a sliding clasp that is bolted in place about the stilt. A pin fixed at the top of the stirrup fits in holes bored at intervals in the stick, and is held in place by a movable collar that slips tightly over the upper end of the steel member, which is bent to come flush with the wood.



is bent to come flush with the wood.

AREA IN WYOMING PROPOSED AS NAVAL OIL RESERVE

Nearly 10,000 acres of land in Natrona County, Wyoming, are embraced in a tract recently recommended to the president by the secretary of the interior to be set aside as an oil reserve for the use of the United States Navy. This area covers what is known as Teapot dome, southwest of the Salt Creek field. It is about 30 miles north of Casper, an oil-refinery town, and is also adjacent to two pipe lines. The land was previously included in an oil withdrawal and it is stated that the dome has never been drilled. So, in choosing the site, the government is not, so far as is known, interfering with any private interests.

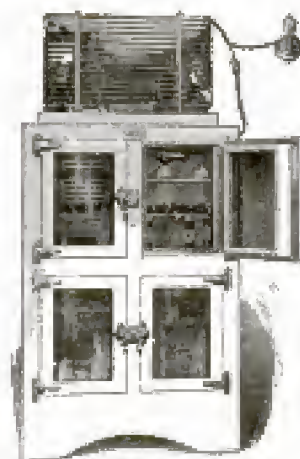
REFRIGERATING MACHINE

9762 FOR HOME USE

With a new refrigerating machine that operates on the same principle as an ammonia machine but uses sulphur dioxide instead of ammonia, refrigeration in the home is made possible at less expense for operation than is required in keeping an ice chest supplied with ice. This machine, which is used with an ordinary refrigerator, is operated by a $\frac{1}{4}$ -hp. electric motor that takes its current from an ordinary electric-light socket. The current consumed through the intermittent working of the machine is about one kilowatt per day, which is less than that consumed by a 40-cp. tungsten lamp burning continuously. With sulphur dioxide it is possible to use copper piping in the condenser, since copper, while it deteriorates rapidly when exposed to ammonia, is not affected by sulphur dioxide. This, together with the fact that copper has a higher degree of heat conductivity than steel, leads to one of the most important features of the machine—the substitution of air cooling for water cooling, with the consequent elimination of all apparatus for circulating the cooling agent through the condenser coils. In addition to this, lower gas pressures are generated by sulphur dioxide than by ammonia, and it is a safer gas to use. At atmospheric pressure sulphur

dioxide boils at about $+14^{\circ}$ while ammonia boils at -28° Fahrenheit.

The sulphur dioxide leaves the condenser as a liquid. At the entrance to the refrigerator coils it passes through a regulating valve that reduces its pressure to that of



the atmosphere. This is accomplished by a diaphragm which controls the valve by which the liquid is admitted and

May 1-1916 Lake. Inc.
1735 Mt. Elliott Av.
Detroit, Mich.
Iske Co. of Chicago 3430

Hi-Lo Manufacturing Co., Sterling Ill.

Christian Science Monitor, May 10-1915

Mechanical Refrigeratory Co., 1000 Wisconsin St. Chicago, Ill.

Copyrighted material

which is subject to the pressure of the liquid on one side and to that of the atmosphere on the other, the valve being alternately opened and closed by the deflections of the diaphragm under the varying pressures. In the refrigerating coils the liquid expands into a gas, a process that results in the absorption of heat and the consequent lowering of the temperature within the refrigerator, the action being exactly the same as that of expanding ammonia. After leaving the refrigerating coils the gas passes to the pump, which condenses it and discharges it into the condenser coils. As it travels through these coils the heat produced by the condensing process is carried off by air circulating through the coils and the gas becomes a liquid. This liquid then passes to the refrigerator, this circulation being kept up as long as the machine is in operation. The operation of the machine is intermittent and automatic, the motor being started and stopped as required by a thermostat adjusted to maintain a certain temperature in the refrigerating chamber. The condensing apparatus may be set on top of the refrigerator, in the basement, or in any other convenient position.

9869.

ONE LOAF OF WHITE BREAD FIFTEEN FEET LONG

One loaf of bread sufficiently large to supply the needs of a family of four persons adequately for a period of probably three months, was recently baked at Seattle. It was 15 ft. in length, several feet in circumference, and weighed 100 lb. It was subsequently consumed at a banquet.

BICYCLE IS SETTLING PLACE FOR SWARM OF BEES

A bicycle standing at the curb in front of a confectionery store on a business thoroughfare at Whittier,



Swarm of Bees Clustered on the Seat of a Bicycle Standing on a Business Street in a California Town

Cal., recently served as a settling place for a large swarm of bees. For more than two hours the insects succeeded in turning shoppers to the opposite side of the street and crowding vehicular traffic well into the middle of the pavement. Oddly enough, the bees in settling chose the seat of the cycle as a clustering place and piled themselves nearly a half foot deep upon it, also thickly covering part of the frame and rear wheel. Subsequently a hive was procured and the bees transferred into it by a policeman.



This Bread was Placed on Exhibit at a Convention of Bakers

W. D. Chandler,
The Times,
Seattle, Wash.

James S. Hamilton,
517 Olive Street,
Whittier, Calif.

8834 ODD SUSPENSION BRIDGE IN USE IN MICHIGAN

Connecting the town of Croswell, in the eastern part of Michigan, with a picturesque little park on the opposite

cables, each $1\frac{1}{4}$ in. in diameter, which are stretched $3\frac{1}{2}$ ft. apart. The flooring is held in place by long spikes driven through the planks and clinched around the cables, which are anchored to heavy timbers imbedded 6 ft. beneath the surface of the ground on each bank. At intervals of 8 ft., a plank is extended for 3 ft. beyond the edge of the structure to form a support for the bracing member of an upright to which a woven-wire railing is attached. The bridge was built about nine years ago.



The Planking is Supported on Top of Two Parallel Steel Cables

bank of the Black River, is a suspension footbridge 200 ft. in length. Instead of being constructed so that its flooring is suspended from the supporting members, the 2-in. planking is laid crossways on top of two parallel steel



In Length the Structure Is Approximately 200 Feet. It has Been in Use for Several Years

SIMPLE METHOD OF FINDING HIGH TEMPERATURES

9050 Sentinel Pyrometers & Vials

A new method of measuring high temperatures, recently invented, does away with the necessity for the use of a pyrometer and reduces the process to such a basis that it can be applied by an ordi-

nary workman in the regular course of his work. This method consists in the use of different metallic salts which are made into molecular mixtures and which melt down at different temperatures within the range between 428° F. and $2,426^{\circ}$ F. Each salt has its definite melting point and this is



marked according to the centigrade scale on the package containing the salt, as shown in the illustration. The salts may be done up in any kind of package, but are usually cast in solid cylinders, $\frac{7}{16}$ in.

Carl Kehl's Alloy Co.
248 Brush Av., Detroit, Mich

in diameter and $\frac{3}{4}$ in. long. For temperatures under 932° F. the salts can be used in an air-tight glass tube, such as is shown in the illustration. They can then be used repeatedly, as they become solid again the moment the temperature falls below the melting point. The salts are also made in the form of paste which can be daubed along a steel bar and thrust into furnaces, ovens, retorts or flues, to find the temperature at which they are operating. In addition to its value as a simple and quick means of determining temperatures in the ordinary run of shop work, this method may also be used for checking a pyrometer. In doing this, a salt cylinder is placed at the end of the thermocouple. When the salt melts, the pyrometer should read the same as the temperature marked on the cylinder.

SANITARY MILKING PAIL PROTECTS CONTENTS

A milk pail which tends to prevent the unnecessary contamination of its contents by flies and dirt has been invented and patented by a Texas ranchman. Instead of being open and therefore a catchall for filth, as is the ordinary bucket, the device is provided with a cover having a funnel-shaped opening in the middle. A sanitary sleeve with slits for the insertion of



Danger of Dirt Falling into the Pail is Lessened by the Use of the Cover and Milking Sleeve

the hands is fixed to this, so that the aperture in the bucket is entirely inclosed during the milking operation.

Lester L. Sargent, Jr.
700 Ninth St.
Washington, D.C.

WEATHER BANNER IS USED ON MOVIE RANCH

At one of the motion-picture ranches in southern California a novel method is employed by the head of the camera



When This Flag is Displayed Outdoor Movie Work is Suspended on the Ranch

department to inform his associates whether or not the light conditions are satisfactory for outdoor photography. Because of unsettled and cloudy weather the production of pictures had been materially hindered. So much film was being wasted on account of poor judgment on the part of some of the operators that the head of the department decided to be the sole judge of when and when not to take pictures. Accordingly he had a large flag made on which the two words, "Don't Shoot," appear in big letters. When the lighting is poor and in his opinion not right for movie work, the banner is run up on a tall mast where it may be seen from any point on the ranch. So long as the flag remains floating, outdoor work is not undertaken.

Albert Wapley
322 Bayview St. Tropico, Calif.

Inventor: M. S. Walton, Lord Motor Car Company, Hope & 11th Streets, Los Angeles, Calif.

Al. L. Waddell 15 Milard Ave. Venice, Calif.

9967 POPULAR MECHANICS

LARGE GREASE GUN BUILT FOR GARAGE USE

For the purpose of facilitating the operation of packing grease in the gear box or differential housing of a motor



Forcing Grease from the Gun into the Differential Housing of a Motor Car

car, a western inventor has developed a grease gun which holds approximately 30 lb. of lubricant and does its work in less time than is required in inflating a tire. The device, which is built similarly in principle to smaller instruments of a like nature, consists essentially of a long cylinder supplied with a plunger and strong hose through which the material is forced. It is mounted on small wheels so that it may be moved about a garage easily.

The pressure exerted in forcing lubricant into a gear box packs the grease even better than can be done by hand, it is said.

9184

REMARKABLE CEMENT BRIDGE OVER BELGIAN RIVER

Across the River Ourthe, at Liege, Belgium, is a reinforced-concrete bridge which, although now 10 years old, is so daring in design that it still commands the interest of engineers. Its remarkably small rise, the extreme length of the center span, and its action under severe tests are all points that remove the structure from the ordinary class. The slender, slightly arching main span is 180.4 ft. in length, while the two end spans are approximately 69 ft. long. The former member has a rise of only 11.97 ft., and at the crown has a thickness amounting to but 1.15 ft. The strength of the bridge has been fully attested by its years of service, while at the outset, before its acceptance, it was subjected to the stresses occurring from having a large body of troops march in various formations back and forth across it, both in regular and double-time step. There are few things which place a greater strain upon a bridge than stresses caused by the rhythmical step of marching soldiers. In this case, however, the bridge showed a deflection of only 1/4 in. under the passage of soldiers at quick step.

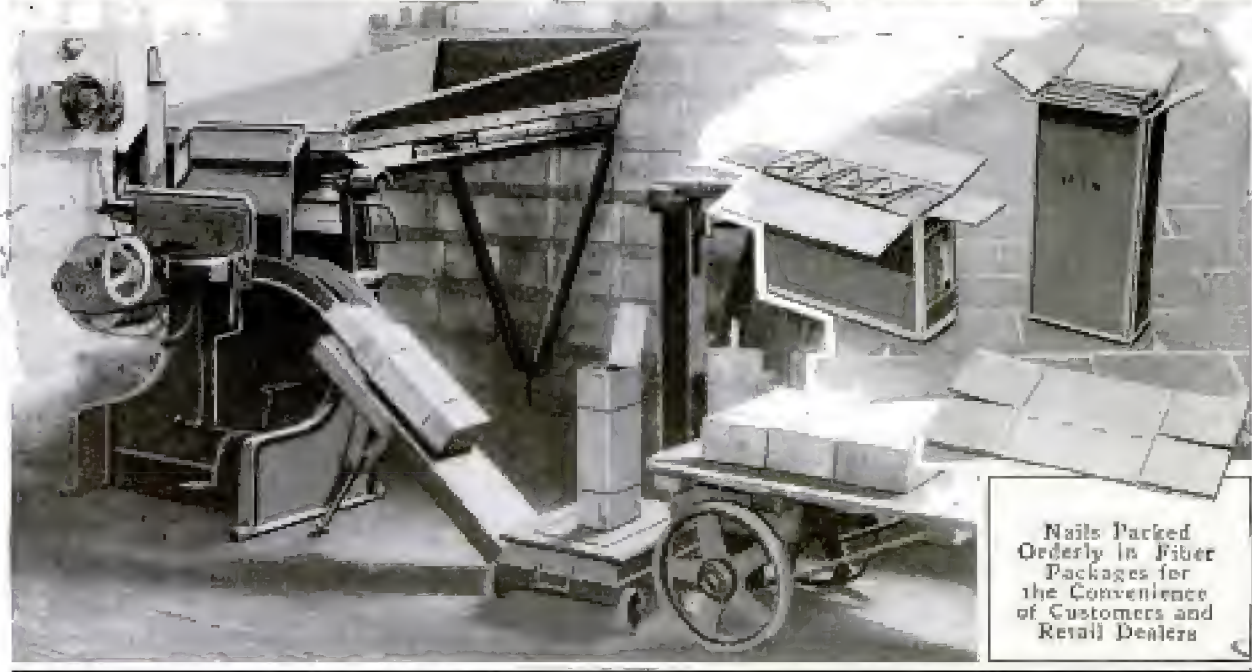


This Striking Example of the Exceptional in Concrete Construction Is the Pont Matisa at Liege, Belgium

Cement World. 1827 Prairie Ave., Chicago, Ill.

*Refers: Albert J. Otto & Sons, (Manufacturing U.S.)
1876 Broadway, New York City*

Inventor: Mfr. Otto, Gampar Zurich, Switz
POPULAR MECHANICS 417



*The machine illustrated is in the plant of
Jorge Bros 67 West Madison St,
Chicago, Ill.*

*HP
motor
the Kew
er day
the
agent*

9912

NEW NAIL-PACKING DEVICE WORKS MAGNETICALLY

In an attempt to lessen both the labor and expense of nail packing, a machine has lately been developed which apparently does the work much more efficiently than is possible by manual means. With it manufacturers are enabled to box nails in pasteboard or fiber cartons for the convenience of customers and retail dealers alike, and at the same time make an approximate saving of four per cent in freight charges.

Ordinarily nails are packed in wooden kegs. In doing this about a third of the contents are usually placed in the containers by hand in order that the tops may be put in place. This practice is overcome by the machine, which arranges the nails in parallel rows so that they may be placed in either boxes or kegs in an orderly manner, eliminating waste space and allowing the use of smaller containers.

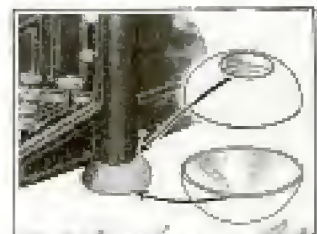
The paralleling of the nails is done electromagnetically. This is possible since linear metal objects voluntarily adjust themselves in relation to the lines of force when placed in a homogeneous magnetic field, which is done in this instance. The nails are fed into a trough, each side of which serves as

a magnetic pole. As they are automatically lined a lever is drawn down which breaks the current and compresses the bulk compactly. The tray is then inclined so that the nails are emptied into the packing cases. The machine is said to be capable of packing 20 kegs of foundry nails, or from 40 to 60 kegs of 6-in. nails, in an hour. Four kegs of the former nails are ordinarily packed in an hour by the manual process.

4638

SILENCING ATTACHMENT FOR TYPEWRITER

For making a typewriter as nearly noiseless as possible a new rubber attachment has been brought out that keeps the vibrations of the machine from being transmitted to the supporting table and thus prevents the table from acting as a sounding board. The attachment consists of a hemispherical piece of rubber made hollow at the bottom to serve as a vacuum cup, with a recess at the top for receiving the leg of the type-



*Mfr. W. J. Gibson & Company,
Fisher Building
(3438, Dublin)
Copyrighted material
Chicago, Ill.*

writer, four of the attachments being used with each machine. The weight of the typewriter compresses the cup sufficiently to bring about a slight vacuum action, with the result that the vibrations are not only shut off but the machine is prevented from shifting its position on the table.

HOW A MOJAVE DESERT HOME IS BUILT

In the Mojave Desert, in southern California, where night temperatures range from 103° F. during the summer months to a point below freezing in winter, a novel type of bungalow has been developed to meet the needs of residents compelled to live in the desert throughout the year. A room, measuring about 10 by 25 ft., is first built, and around this, on three sides, is con-

structed a broad porch, the walls of which are made of regular siding up to a height of from three to four feet, while the space between the top of this wall and the room is screened in. Hinged shutters are also provided, and with these the screened space is closed tightly during the winter. Over the whole a shingle roof is built in such a way as to leave a roomy air space over the central room. The central room is used as living and sleeping quarters during the winter, and usually contains a little sheet-iron heater, while in summer the family lives and sleeps in the screened porch. In order to take full advantage of the faint summer breeze, some of the houses are equipped with a sleeping cage on the roof, which consists simply of an open wood frame entirely covered with wire netting.

¶The cost of analyzing foods intended for export, work heretofore done free by the Bureau of Chemistry, will in future be charged to the shipper.

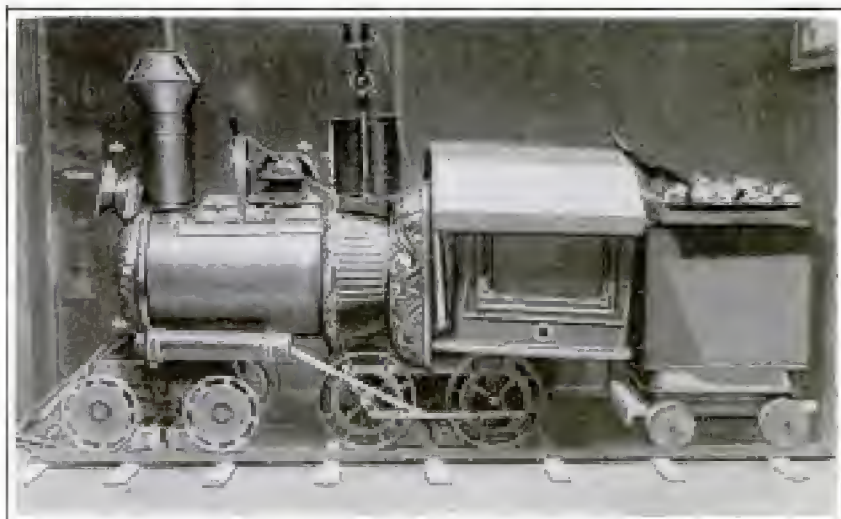


Typical Home in the Mojave Desert: The Screened Porch is Provided with Shutters with Which It can be Tightly Closed in Winter. At the Top is Shown a Roof Sleeping Cage

9923 **REALISTIC ENGINE BUILT OF HARDWARE ARTICLES**

As a means of breaking away from the ordinary in hardware displays, a window decorator of a Carthage, Mo., store succeeded in building a very fair reproduction of a steam locomotive by employing staple articles selected from stock. The result was sufficiently realistic and the execution of the work ingenious enough to have the desired effect of drawing notice to the window. Four lawn mowers, set in pairs with their handles removed, served as trucks for the engine, which had a round stove laid horizontally to form the fore part and a gasoline stove for a cab. The

tender had a washboard base, on top of which, between two drip pans, was a small oven. A cuspidor was used as a headlight, a stovepipe as a smokestack, and a salt shaker as a whistle, while



Lawn Mowers Placed in Pairs Form the Trucks of the Engine

MELTING FURNACE MOUNTED ON BALL BEARINGS

In an attempt to improve the method of pouring molten metal, particularly brass, into the molds in making castings, a crucible furnace has been mounted on ball bearings and fitted with a flexible gas connection so that it may readily be turned about a vertical axis. This allows the forms to be placed about the furnace, so that when the temperature is right the metal is poured directly into them from a cock extending from the melting pot. A control valve regulates the flow, and as one mold is filled, the metal is stopped and the furnace turned, enabling subsequent discharges to be made into the other forms placed in the circle.

9896 **LAUNDRY SERVICE EXTENDED INTO COUNTRY DISTRICTS**

Another step toward idealizing farm life and carrying the advantages of city service into the country is reported. A



This Laundry Wagon Makes Deliveries along a 30-Mile Rural Route

laundry company at Clarinda, Ia., maintains a rural free-delivery route. Packages collected on Mondays are returned Thursdays, and vice versa.

O. R. Meyer,
1429 W. Ninth St.
Des Moines,
Iowa.

Albert Marple
322 Boynton St.
Tropico, Calif.

POPULAR MECHANICS
ORNAMENTAL POSTS PROJECT
BEYOND CURB LINE

In planning to place a pair of ornamental pillars on opposite sides of a roadway intersecting a thoroughfare in front of his grounds, a property owner found that the posts would be out of proper alignment if erected back of the curb line as had been intended. To overcome this difficulty he had the stonework constructed over the gutter, the back edges of the two members resting on the curb and the foreparts projecting into the street. In order not to obstruct the drain, the bases of the pillars, each of which are 30 in. square, were built with passages, 18 in. broad and 8 in. high, beneath them.



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100
RAILWAYS LIABLE FOR VALUE
OF BAGGAGE IN TRANSIT

In accordance with the provisions of a recent amendment to the Interstate Commerce Act, railway companies are now held responsible, to the extent of its declared value, for the loss or damage of personal baggage in transit from one state to another. Heretofore the roads, by their own rulings, have limited their liability to a maximum of \$100. Many eastern railroads are requiring the owner of baggage to make a written declaration of its value at the time of checking it.

Some companies are announcing that in case baggage is valued in excess of \$100 the owner will be charged an insurance fee of 10 cents for each additional \$100, or fraction thereof. The valuation ruling does not affect intrastate shipments.

8731
WOOD CASINGS AND SASHES
ELIMINATED IN WINDOW

Designed to give a practically unobstructed view and efficient ventilation, a window intended particularly for large buildings and hospitals has been introduced which entirely eliminates wooden sashes and casings. It is provided with three separate panes of glass, the lowest of which is stationary and serves as a draft deflector. The other two sections, which are fitted in narrow steel frames that make them, so far as appearance is concerned, almost sashless, are counterbalanced so that when one is raised the other is simultaneously lowered. This means that there is always an opening at the top equal to that at the bottom, causing a free circulation of air. Instead of operating by weights and pulleys the window is controlled by a pinion which acts between ratchet strips screwed to the two sashes. The window is made weather-tight by means of felt packing in a channel at the meeting rail, which also prevents the windows from rattling at that point. Provision is made for the expansion and contraction of the metal.



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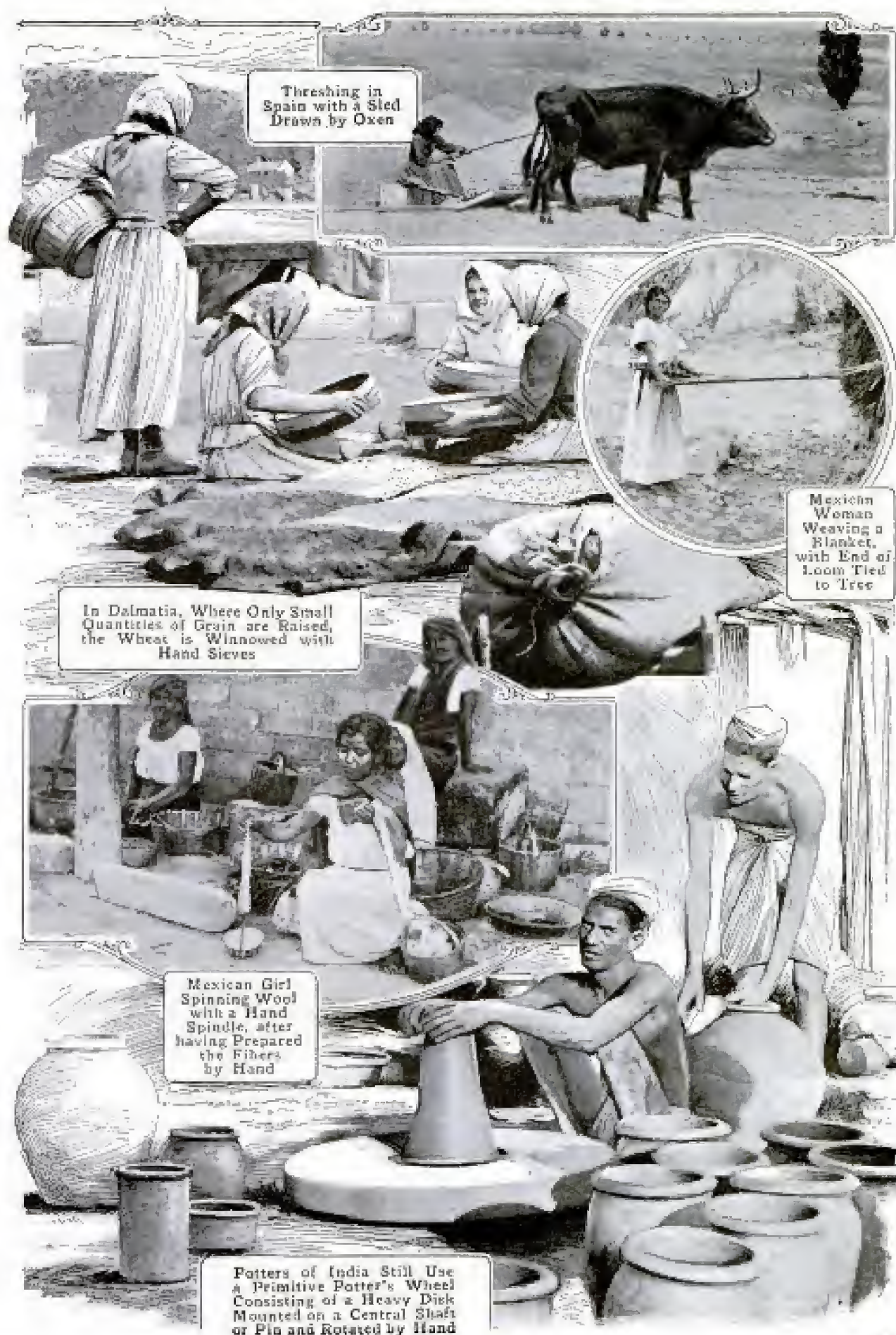
10-4-15
Refer to J. B. W. Transo
104 So. Mich. St.
Chgo.

Copyrighted material

J. W. Lee, Jr.
Publicity Agent, Pennsylvania R. R. Co.
Broad St. Station
Philadelphia, Pa.

Advertisement for Wood Casings and Sashes Eliminated in Window
H. E. Jackson, Albany, N. Y.

PRIMITIVE PROCESSES IN FIELD AND HOME



Underwood & Underwood.
417 Fifth Ave.
N. Y. C.



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Bridge in Asiatic Turkey That Makes a Sharp Turn near the Middle of the River

BRIDGE MAKES SHARP TURN AT MIDSTREAM

A novel feature in bridge alinement is found in the bridge over the River Alis, at Sivas, in Asiatic Turkey, which makes practically a right-angle turn near the middle of the stream. The

change in alinement is due to the fact that the river at this point has two channels, with the result that it was necessary to build the sections as they are, to make the arch openings at right angle to the current in each of the sections. Sivas is about 600 miles east of the Dardanelles.

HARDSHIPS OF TRAVELING IN WAR-RIDDEN MEXICO

Railway transportation facilities in the Mexican war area at the present

falls to their lot. A string of motor cars is usually carried on flat cars, and these are used by the women and children as sleeping quarters at night, and as cooking places during days when the troops are entrained. Those whose accommodations are limited to the meager facilities available beneath freight cars make traveling possible by placing a rope netting or wooden frame-



Motor Cars Carried on a Troop Train are Occupied by the Women and Children as Sleeping Quarters

time are remarkably crude, as might well be imagined. But the conditions met even by the armies of Villa and Carranza, which have access to everything in the respective territories controlled by them, are striking, to say the least. The soldiers and their families travel on top, inside, and beneath



Riding the Rods beneath a Freight Car in Comfort. Pillows and Blankets are Placed on the Ropes Substantially Woven between the Bars

work across the rods and padding this with pillows and blankets. Although

a dangerous place to ride, it is frequently a much more comfortable one than the inside of a crowded, dirty stock car, or the top of an unshaded box car.

Clipping from newspaper

SMALL MEN AND SHORT LIFE TO FOLLOW EUROPE'S WAR

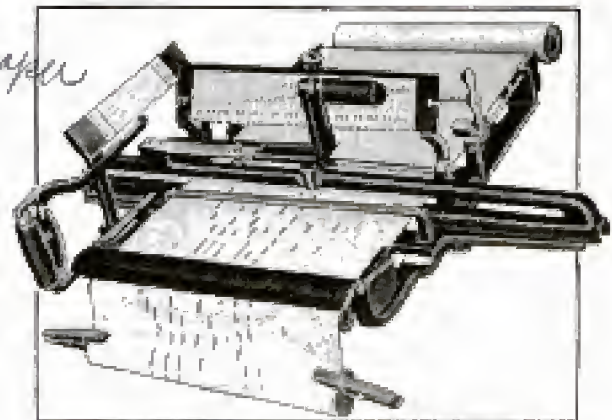
In Europe an imprint of the present great conflict will be borne by future generations for years to come, according to certain prominent authorities on racial conditions. The war is obliterating the strongest physical types of manhood and obviously placing upon the weakest and most undesirable classes the responsibility of perpetuating their respective races. The effect of this, it is contended, will be that the men of Germany will be approximately an inch shorter in stature than their forefathers. The French, it is believed, will become the smallest race of men in Europe. In support of this theory it is cited that the average stature of Frenchmen was weakened and the height appreciably lessened as a result of the Napoleonic wars. Length of life will also be shortened correspondingly in the various countries affected by the struggle.

RECORDS FOR PLAYER PIANO MADE BY SIMPLE DEVICE

To enable an owner of a player piano to make his own records, an Ohio inventor has perfected a simple machine which allows such work to be done readily in the home by anyone who is at all familiar with music. The device not only lessens the cost of a record, but also makes it possible to obtain exactly what is wanted, since it is within the power of the operator to set a selection in whatever key he wishes when perforating a roll.

The device consists essentially of a punching instrument that slides along a scale, so divided as to correspond with the apertures in the tracker board of the player piano, and cuts slots of the required lengths. The roll of blank paper is inserted at the back of the

machine and fed across a platen plate. Guiding members at each side and grips at the ends serve to track the

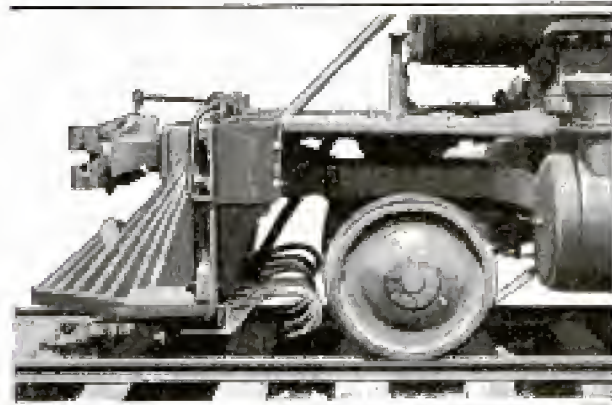


By Using This Machine the Owner of a Player Piano may Provide Himself with Records He Wants and in Whatever Key Desired

paper properly and prevent it from wrinkling. As the punching is done the paper is moved forward and wound on a roll at the front of the machine. By this means old selections unavailable in stock records may be made.

HOOKS PLACED UNDER PILOT ON LOCOMOTIVE

With the idea of preventing the derailment of a locomotive when it encounters some minor track obstruction, a Louisiana railway man has constructed a hook fender which is intended to be attached at the back on the under side of a pilot. It consists of a row of large hooks the points of



Hooks Arranged beneath the Pilot of Locomotive to Prevent Derailments

which face forward in such a position as to grapple things which the pilot might not strike.

Inventor:

Charley E. Mattison,
Sibley, Iowa

*See Nov 16-143
adv.*

*Station H
Leabarian Mfg. Co., Hamilton, Ohio
Mfr*

*Detected. Sargent
700 Ninth St., Washington, D.C.*

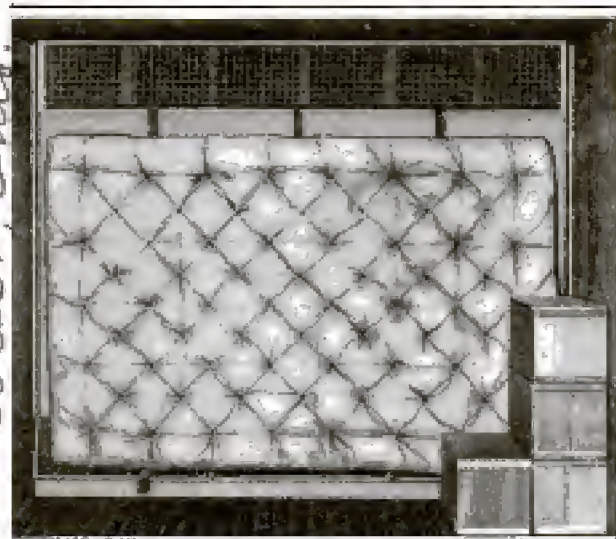
#Lester L. Sargent
700 North St.

424 Washington, D.C. POPULAR MECHANICS

FREIGHT CARS ARE PADDED

9460 FOR EGG SHIPMENTS

In an attempt to find a means of lessening the breakage of eggs and other fragile things during the course



Protecting a Consignment of Eggs from Excess Breakage by Placing Heavy Cushions between the Crates and the Car Ends

of railway transportation, an Ohio shipper has adopted the practice of placing shock-absorbing cushions in the ends of a freight car when loading it. These are made in mattress form and fastened by means of clamps to frameworks securely attached to the walls. By placing this padding between the car ends and the egg cases, some of the heavy jolting resulting from the sudden stopping and starting of a train is taken up. When it is not in use the device is suspended from the ceiling of the car. Obviously, the plan could be employed equally well in protecting shipments of other character.

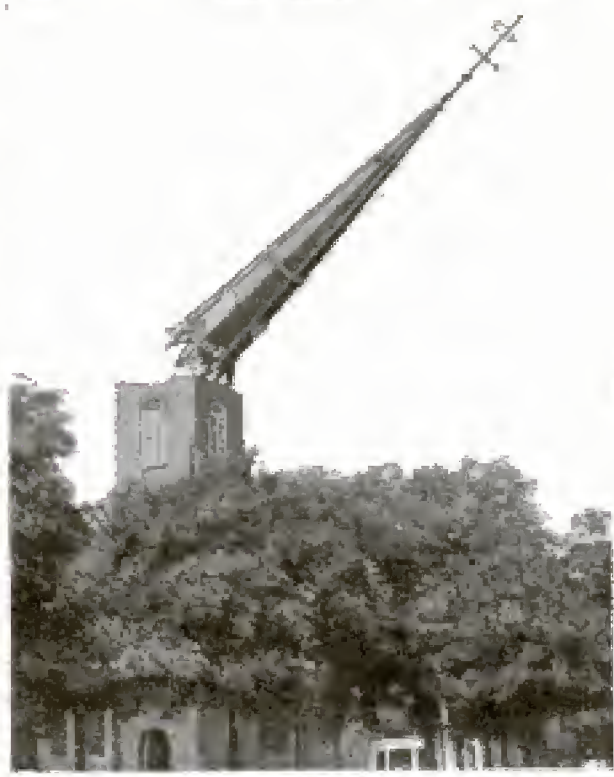
LIBERTY BELL TRANSPORTED ACROSS THE CONTINENT

For transporting the liberty bell from Philadelphia to the Panama-Pacific Exposition where it is now exhibited, a specially constructed car was used which was designed not only to transport the historic relic but to shield it from damage during the trip. The car is of all-steel construction, is

capable of carrying a weight of more than 100,000 lb., and is so made that practically no shocks or vibrations are transmitted to the bell. Current for illuminating the bell and car at night was supplied by an electrical generator mounted underneath the floor of the car and operated by the axle.

REMOVE CHURCH STEEPLE BY OVERBALANCING IT

Examination recently showed that the steeple on one of the old churches at Eufaula, Ala., was in an unsafe condition and that its removal was advisable. To reduce the expense of this work to the minimum, it was decided to fasten a cable about the upper part of the structure, the pinnacle of which was 135 ft. from the ground, and with the aid of a winch overbalance it and allow it to fall to the earth. This



This Shows the High Steeple Falling to the Earth after being Purposely Overbalanced

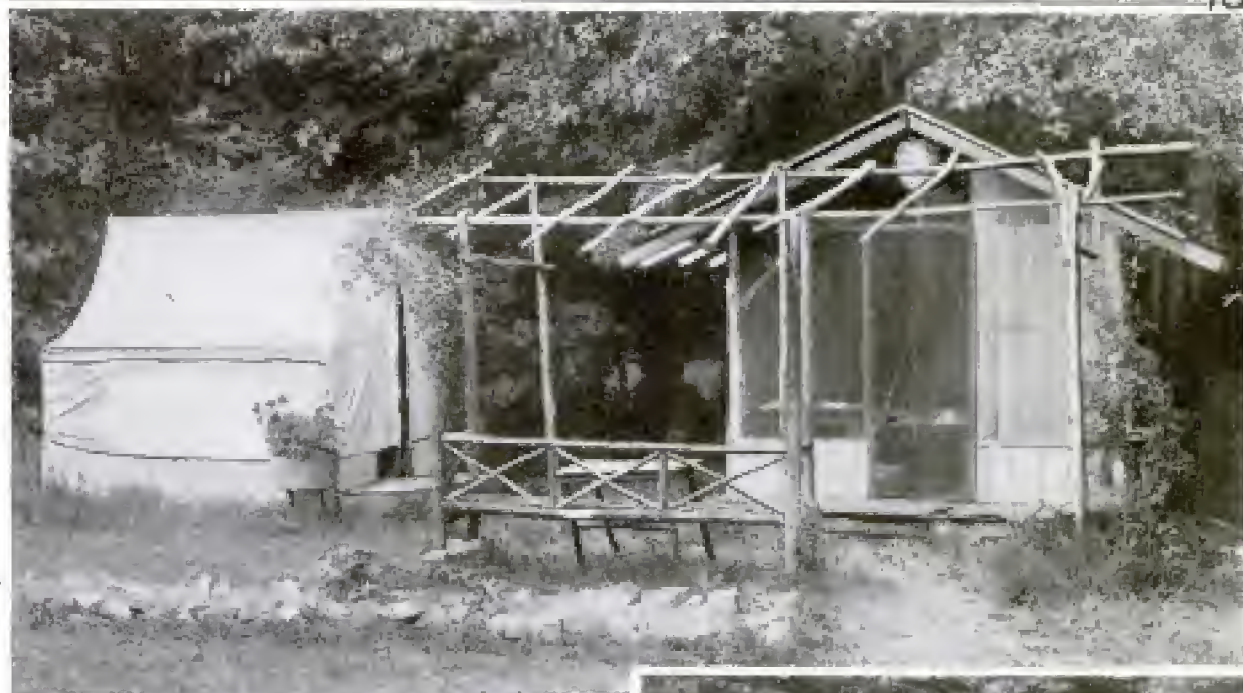
method proved both easy and satisfactory. The spire dropped point first, the base striking the farthest from the bottom of the tower.

Is interested in:

✓ Mr. Bolton Hall.

POPULAR MECHANICS

29 Broadway
New York
City.



9383
**ECONOMIC REFORMS TESTED
BY JERSEY COLONY**

In the Bernardsville Hills, a few miles west of Summit, N. J., there is a small community styled by its colonists "Free Acres," and organized for the purpose of demonstrating the fundamental ideas of Henry George's single-tax doctrine. The land, consisting of some seventy acres of farm soil, is owned by a controlling association and leased in perpetuity to its residents.

The settlement is not confined to single-tax enthusiasts, but is open to all who are in search of personal and economic freedom of a kind not to be found under the prevailing forms of government elsewhere. An annual fee is exacted for the ground occupied by each individual, the amount of this being determined by an elected assessor. The money thus collected is used in paying the taxes on the land, building roads, maintaining a water-supply system, making surveys, and defraying the expenses of other works necessary for the community's welfare or comfort. Most of the colonists use less than an acre of ground.



Many Simple, Airy Summer Cottages Like These are Owned by the Colonists. A Number of the Settlers, However, Have Permanent Homes at "Free Acres" Where They Reside throughout the Year

While some of the residences are constructed for year-around occupancy, most of them are built as summer homes. A "common" is retained for outdoor sports and various recreational purposes, and a club house provided for dances, public meetings and other uses. It is there also that gatherings at which literary, social, and educational topics are lectured upon and discussed, are held. Artists, actors, writers, business men, tradesmen, and their families, for the most part, make up the membership of the settlement. Many conventionalities observed elsewhere are disregarded by the colonists, who live free, uncensored lives.

*Hamilton M. Wright
Publicity Editor, Panama Pacific
Exposition, San Francisco, Calif.*

9428 POPULAR MECHANICS
GIANT TELEPHONE BUILT FOR EXHIBITION

For display purposes at the Panama-Pacific Exposition, one of the large



This Telephone, Patterned Carefully after a Standard Desk Instrument, Is 15 Feet in Height

electric companies has built a telephone instrument of the desk type which measures 15 ft. in height. The receiver is 6 ft. 8 in. in length, while the aggregate weight of the device amounts to 1 1/4 tons. It is merely a curiosity, but in all of its details it so carefully copies its small prototype that it is interesting to see. Obviously, it is the largest telephone instrument in the world.

¶The Lincoln Highway from New York to San Francisco has been selected by the Auto Club of America as the route for the two cross-country flights to be held some time in 1915.

*Army & Navy Journal
May 1-1915*

BRONZE-GOLD REFLECTOR FOR SEARCHLIGHT

Government tests are reported to have shown that a new type of mirror, now used on the largest searchlight in service in the United States Navy, is manifestly superior to any reflecting medium heretofore developed for this purpose. Instead of being made of silver-surfaced glass, the parabola consists of a bronze casting electroplated with gold. This form of construction seems to have a number of important points in favor of it. Silver is always subject to corrosion, while gold is not. Furthermore, the optical properties of gold reflecting surfaces are superior to those of silver in that the gold rays penetrate thick, foggy atmospheres much more efficiently than does light reflected by a silvered mirror. Equally important is the greater substantiality of the new reflector. It is capable of withstanding shocks which would shatter its predecessor. A bullet might pierce the bronze-gold reflector without seriously impairing its usefulness, while a comparatively light concussion would completely disable the silver-glass mirror.

FLEXIBLE GRIPPING JAWS MADE FOR VISE

As a means of overcoming the difficulty of holding an irregularly shaped object firmly in a square-jawed vise, an English inventor has developed an



Flexible Gripping Members Fixed to the Jaws of This Vise Allow Objects of Irregular Shape to be Held Firmly

*Postgate Square,
Postgate Hill, London, E.C.*

*cont:
Edward Sealey
69 East 59th Street
N. Y. C.*



Electric "Safety-First" Sign Erected in One of the Tunnels of an Idaho Gold Mine

auxiliary attachment which is capable of distorting itself and fitting the outline of any member pressed against it. The device consists of a pair of flexible jaws which may be fixed to any ordinary tool of this character. The gripping pieces are composed of a series of small, linked levers arranged in rows one above the other. Each of these individual members moves freely except when all of them are subjected to pressure by screwing the vise together, at which time they take the outline of the object to be gripped and set themselves firmly. Special clamps are provided for fixing the jaws in place.

9937

ILLUMINATED SAFETY SIGNS PLACED IN MINES

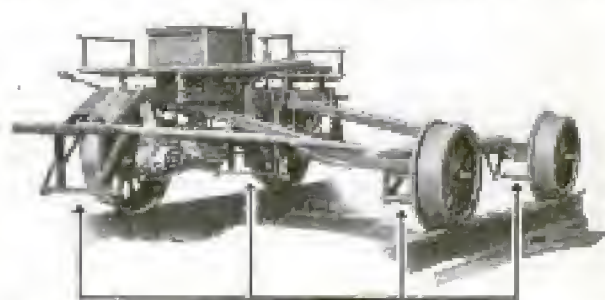
Ever since the establishment of the Bureau of Mines the government has labored unceasingly to make the industry a safer one for its thousands of workers. It is now recommending that operators erect electric "safety-first" signs in their mines in order that the men may be given a constant reminder of the necessity of exercising care and

avoiding unnecessary danger. It is consistent with human nature that men continually facing danger grow fearless of it and therefore frequently lax in their observance of precaution. It is because of this that the "safety-first" sign has a valuable psychological effect. Many mine owners, it is reported, have responded to the government's suggestion.

9855

GUARD KEEPS DERAILED MOTOR CAR ON TRACK

To prevent the injury of operator or passenger when a motor car such as is used on railroads for inspection purposes jumps the track, an attachment has been devised for keeping the car



The Horizontal Guards Prevent the Car from Leaving the Track When the Wheels are Derailed

L. L. Sargent
700 North St.

Washington, D.C.

Inventor: Roy T. Sargent
Beaumont, Oregon

Properties are at Kellogg, Idaho.
Dwyer, 1722
Washington, D.C.

from leaving the rails and for holding the derailed wheels off the ties. This device consists simply of a horizontal guard for each wheel placed a few inches above the rail and designed to slide on the rail and support the car in

case the wheels are derailed. The ends of each guard are provided with downward projections that prevent its sliding off the rail. The device can be applied to handcars as well as to motor cars.

9820

MULTIPLE-ARCH DAM BUILT IN BIG BEAR VALLEY

In constructing the Big Bear Valley dam, which has a 22,880,000-gal. capacity, a California engineer adopted



One End of the Dam Showing Its Type of Architecture

a style of architecture which proved a saving in material and reduced the cost of the work to approximately \$5.83 per million gallons. The structure is of the multiple-arch type reinforced with heavy buttresses. It has a length

on the crest of 363 ft. and is 92 ft. in height, while the amount of material used is surprisingly small. It consists of a series of 10 arches, each 32 ft. in length of span, set between 11 buttresses, and is flanked at either end by short wing walls. The material employed is reinforced concrete.

9145

STEEL TANKS FORM PICKETS OF UNUSUAL FENCE

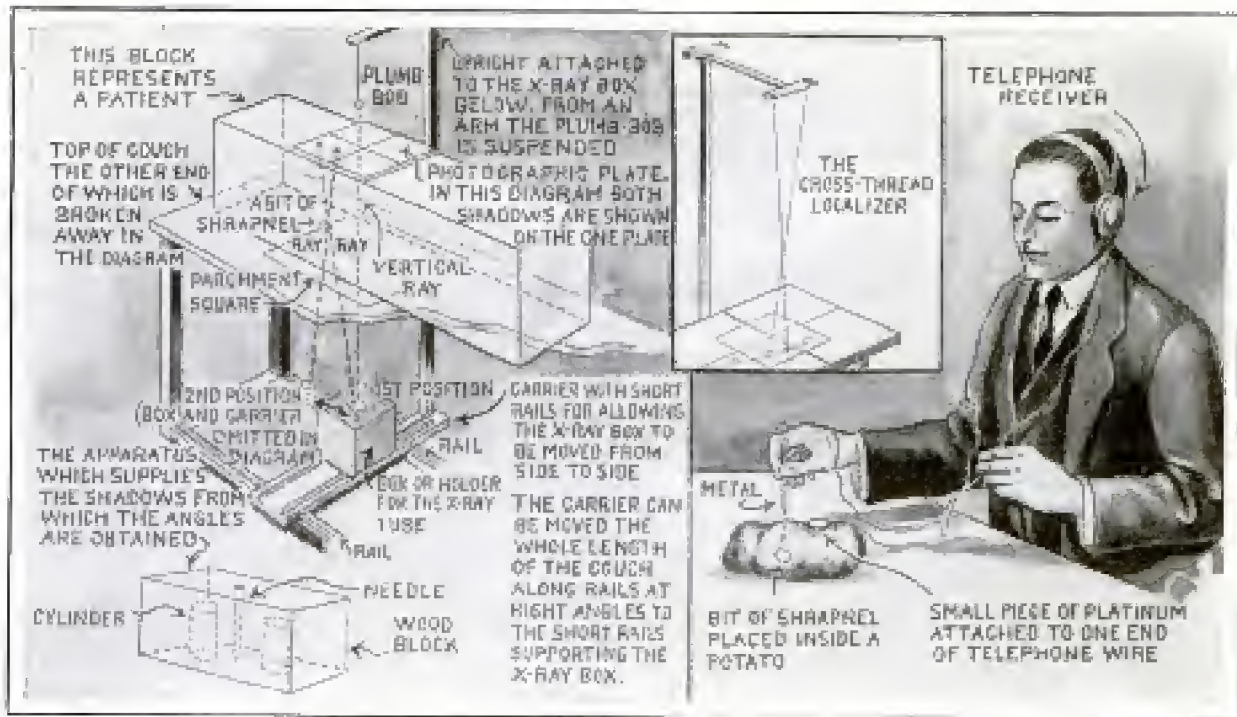
To inclose the grounds of a Los Angeles plumbing establishment, and to serve also for advertising purposes, a fence has been constructed with water tanks, hot-water heaters, and piping. The appearance of the barricade is so striking that it attracts much attention from those passing. The tanks are set on short lengths of pipe, and are connected at the top by means of T-joints to the segments of a tubing which extends around the inclosure. Along the side which faces the street, a number of different types of hot-water heaters have been attached at the sides of various tanks and connected as if they were intended to do service. All the containers are painted gray and the piping black.



This Novel Fence Serves Not Only to Inclose the Grounds of a Los Angeles Plumbing Establishment, but has Proved Efficient as an Advertising Medium

#C L Edholm, 1353 W. 86th Place, Los Angeles, Calif.

J. S. ... 620 S. Broad St., Los Angeles, Calif.



COURTESY THE ILLUSTRATED LONDON NEWS

Diagrams Showing How the X-Ray Method is Used for Locating Bullets or Pieces of Shrapnel in the Bodies of Wounded Soldiers; Method of Using the Telephone for This Purpose is Shown at Right

Illustrated London FINDING BULLETS IN BODIES OF WOUNDED SOLDIERS

In connection with the enormous amount of surgical work made necessary by the European war a number of methods have been developed for finding the location of bullets or pieces of shrapnel in the bodies of the wounded. Two of these methods in particular appear to be thoroughly practical and reliable, one of these making use of the telephone and the other the X-ray. The principal feature of the X-ray apparatus is a lamp, boxed in except for an aperture at the top, and mounted on a carrier. The carrier runs on rails lengthwise of the apparatus while the box runs on rails lengthwise of the carrier, so that the lamp can be shifted to any position. Supported on the carrier by means of a standard and arm is a plumb bob that hangs directly above the X-ray lamp. With the bullet approximately located, the patient is laid on the operating table in the same position as the block in the illustration, the photographic plate is laid over the patient as shown, and the point where the plumb

bob strikes the plate is marked. The X-ray is then turned on, with the result that a shadow of the bullet is formed on the under side of the plate. The carrier is next shifted longitudinally on the rails, the process is repeated in the second position of the lamp and a second shadow is formed on the plate. The exact location of the bullet can now be found and measured by means of the "cross-thread localizer." The plumb-bob points and the two positions of the lamp are marked on a table and from the lamp positions two threads, crossing each other in the same way as the X-rays, are stretched upward to points on a horizontal arm representing the shadows on the photographic plate. The location of the bullet is given by the intersection of the threads. In the telephonic method one wire is attached to a platinum plate laid on the skin of the patient and the other to the probe used in searching for the bullet. The probe is inserted into the wound. When it touches the bullet a grating sound is produced in the telephone receiver, and through this the operator is enabled to determine the depth at which the bullet is imbedded.

*International News Service
238 William St.
N.Y.C.
9701*

*The Keystone
4/25/15
pg. 79*

POPULAR MECHANICS

FIRE ESCAPE WORKS LIKE COLLAPSIBLE STAIRWAY

A new type of fire escape for connecting the second story of a building with the ground has been invented and is now being subjected to tests. It consists of a collapsible steel frame that takes the form of a stairway with its lower end resting on the ground when extended, but which can be drawn up and folded compactly against the wall when not in use. It is raised and lowered by a rope and pulley.



INGENIOUS AUTOMATIC LOCK FOR PROTECTING SAFES

To protect vaults from being broken into by cracksmen, a secret auxiliary locking device has been invented which acts automatically when the combination of a safe is disturbed. It is installed between the door and the back cover plate and so arranged that it is neutral at all times unless the regular combination is blown off or tampered with in an illicit manner, at which time the concealed lock is automatically sprung. This confronts the cracksmen with a puzzling situation, for there is no means of his ascertaining the position of the second locking member, even if he is aware of its presence. The location of the device may be varied, while its bolts are also placed in different positions and hidden from view even when the door is opened. Only the owner and the lock company are aware of the exact place at which the device is fitted.

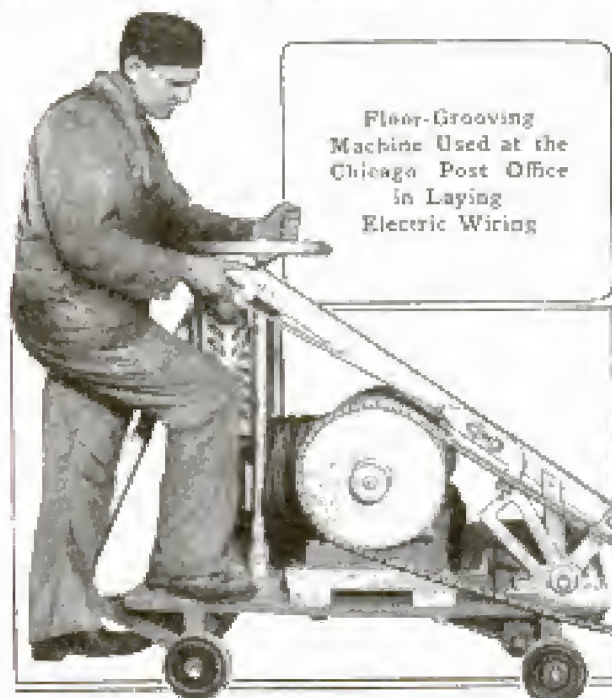
9681

** Robert H. Moulton, Room L. Bd. of Trade Chgo.*

FLOOR-GROOVING MACHINE FOR ELECTRIC WIRING

Most of the electric wiring in the mailing section of the Chicago post office is laid under the flooring. Because of this, considerable difficulty has been encountered in the past in ex-

tending feed wires from one point to another when the position of a mail case or sorting table was changed, or when new ones were added. A recently constructed electric floor-grooving machine has overcome this difficulty, however, and is now being used whenever it is necessary to lay a new cable. The device is built on a low, four-wheeled truck on which a 3-hp. motor is mounted. A long arm reaching ahead of the truck carries a cutting wheel which is connected with the motor by means of a chain. As this revolves rapidly, cutting a slot of the proper width through the floor, it is fed forward by a manual gear. The machine works rapidly and saves hours of labor, especially when it is necessary to cut across the grain of the board.



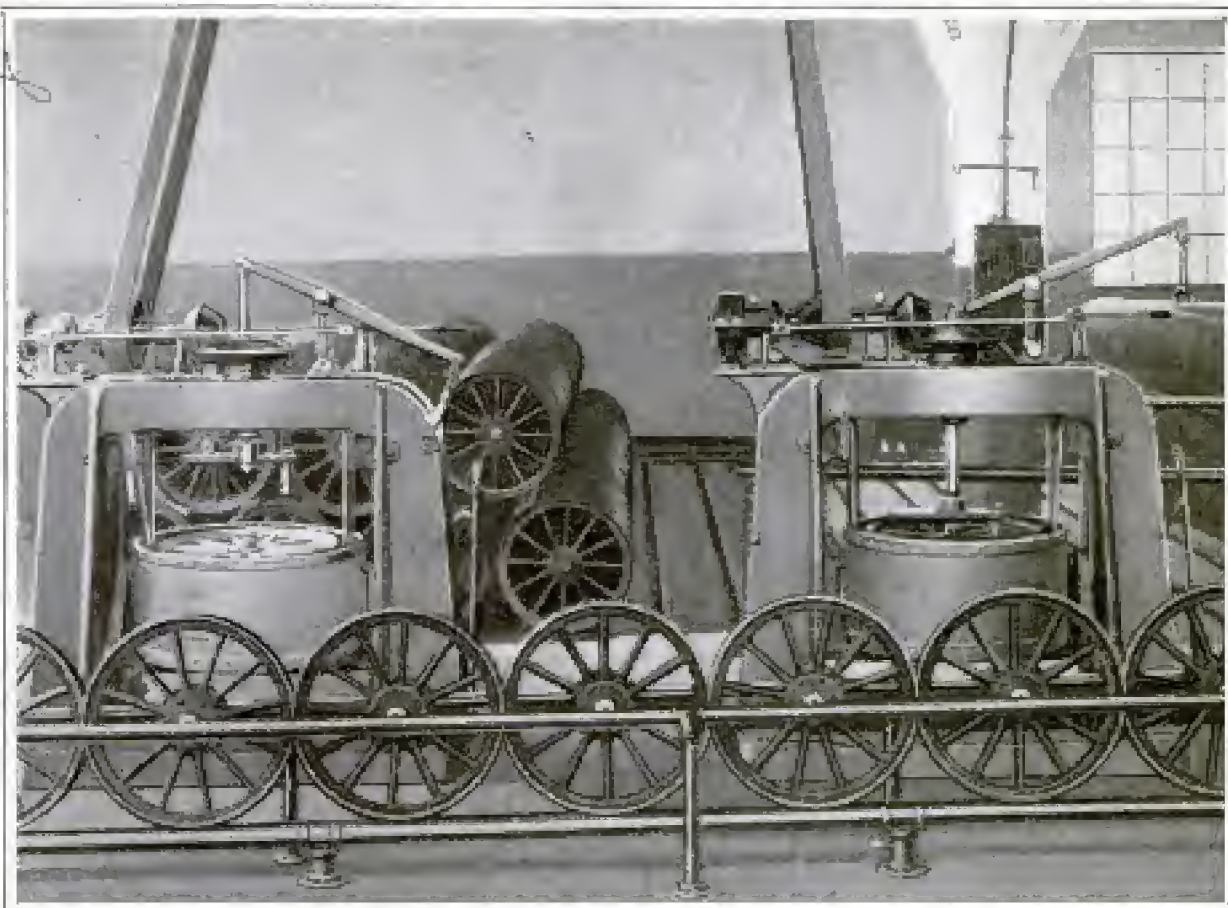
Floor-Grooving Machine Used at the Chicago Post Office in Laying Electric Wiring

When the slot is provided a cable is laid in it, and the aperture is covered with a strip, toenailed and glued into place, which is then planed to the proper level.

*Robert H. Moulton
Room L. Board of Trade,
Chicago*

*Inventor Wm A. Richardson
Chgo. Electrician, Chgo. P. O.*

Chas. C. Snyder,
P.O. Box 468, Pittsburg, Pa.



Tanks for Painting Automobile Wheels: At the Right the Horizontal Arm has been Lowered into Position for Rotating the Wheel

HOW AUTOMOBILE WHEELS 9533 ARE PAINTED

Owing to the great number of wheels to be painted, the common method of applying the paint with brushes is too slow and expensive a process for an automobile factory, and this work is therefore done by dipping the wheels in tanks containing paint. The wheels are run by gravity down an inclined track from the storage room to a point convenient to the paint tanks. Each wheel is then picked up in turn and placed on a vertical axle in the tank, over which is a horizontal arm carrying a pin that engages one of the spokes. The axle, and with it the wheel, is lowered into the tank and immersed in the paint. The axle is then raised until the wheel is well above the paint surface, and the wheel is rotated rapidly by the horizontal bar. The surplus paint is thrown off by centrifugal force, leaving the wheel dry enough to be stored on racks at the rear of the tanks.

LAWYER-PARSON ADVERTISES FOR MARRIAGEABLE CLIENTS

Painted in large, bright letters which may be read a block away, a sign bearing the single word, "Weddings," is hung above the office of a patent and pension attorney at Oakland, Cal. Besides being a lawyer, the man is a minister and employs this method of practicing both professions. His opportunity for obtaining marriageable clients is aided by the fact that his office is but a short distance from that of the county clerk.



John Hoeck,
1512 Lincoln Ave.,
Alameda, Calif.

Harry F. Blanchard,
65 Hudson St., So. Glens Falls, N. Y.

432

POPULAR MECHANICS

WINDING STAIRCASE BUILT 9950 OF CONCRETE

Leading from a viaduct recently built over the Hudson River at Glens Falls, N. Y., to an old cave, famous in Indian



PHOTO BY H. F. BLANCHARD
Spiral Stairway Leading to Famous Cave at Glens Falls, New York

tradition and fiction alike, a poured, steel-reinforced concrete stairway of spiral design has been erected. It contains some 50 steps, is approximately 35 ft. in height, and winds twice around a center pillar, 4 ft. 6 in. in diameter. It forms a convenient by-passage from the bridge and serves its purpose adequately, besides being sightly in appearance.

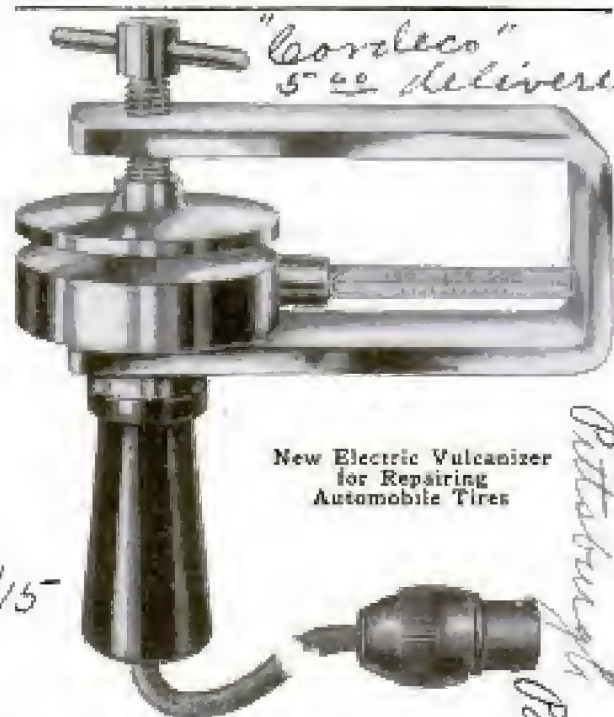
9788 Prometheus 3/20/15 NOVEL SWITCH LOCOMOTIVE FOR INDUSTRIAL PLANTS

A gasoline-driven switching locomotive that weighs only about one-tenth as much as the smallest steam locomotive ordinarily employed in the same class of work is being success-

fully used in Germany for handling railroad cars around the yards of small industrial establishments. This locomotive is too light in itself to exert much tractive power, and to give it the required adhesion to the rails it is run under the end of a car and a section of the locomotive is raised by means of a handwheel so that it takes a considerable part of the weight of the car. The locomotive is driven by an automobile engine and is equipped with a winding sheave for miscellaneous work about the yards.

9703 Garage Equip ELECTRIC VULCANIZER FOR AUTOMOBILE TIRES

With an electric vulcanizer just brought out it is possible to vulcanize a patch or casing cut as well and as quickly, according to reports, as it can be done in a garage. The new vulcanizer is a light and compact device that operates on six volts and takes its current from the storage battery of the car. It is equipped with 6 ft. of cord and can be connected with any light



"Cordeco"
5.40 delivered
New Electric Vulcanizer for Repairing Automobile Tires
Pittsburgh Pa

socket on the car. A thermometer attached to the vulcanizer permits the heat to be regulated to any required degree.

Wm. Corbett & McCounsey Co.,
Columbia Bank Bldg.
Pittsburgh Pa

9948-1913

"FIXED" STARS TRAVELING AT HIGH SPEEDS

That the stars are traveling through space at velocities which are exceedingly high in comparison with any known to ordinary human experience has long been known to scientists. As a result of measurements extending over a long period of years many of these velocities are now known with a considerable degree of accuracy. The average ranges from three or four to about 181½ miles a second. Our own sun, with its family of planets, satellites, comets, and meteors, is rushing through space at a velocity of about 121½ miles a second. These figures are low in comparison with the high-speed stars. At the Mount Wilson observatory several stars have been found to move at velocities of about 125 miles a second, while one, having the highest speed known, travels through space at 201½ miles a second. A curious feature in connection with the subject is that the velocity apparently increases with the age of the star.

wrecked. The enormous number of wrecks that have occurred in this region during a period of only 15 years is indicated by the accompanying map reproduced from a map issued by the



Map Showing the Shipwrecks That have Occurred during a Period of 15 Years: Each of the Little Circles Represents a Wreck

German hydrographic office. The entire region is subject to storms and cross currents and in many places, particularly along the west coast of Denmark, the sea deepens so gradually that a ship can easily run aground when miles out from shore.

GREATEST GRAVEYARD OF SHIPPING

The waters along the west coast of Schleswig-Holstein and Denmark and through the treacherous channels leading from the North Sea into the Baltic Sea are often spoken of as the "graveyard of ships," a name that is evidently an appropriate one in view of the fact that there is no other region in the world where so many ships have been

NEW TYPE OF SELECTIVE TRANSMISSION

In a selective transmission for motor cars that has just been developed, three speeds forward and one reverse are provided without resort to shifting gears, the variations in speed being brought about by an ingenious

Larsen Torpedo Boat Co.
Bridgport Conn.
(Submarine Catalogue)

Scientific American

Inventor & Const.
E. H. Thayer,
708 Michigan St.,
Chicago,
Ill.
N. H.

arrangement of friction-band clutches working in connection with gears that are in mesh continuously. Two shafts are used in this transmission, one

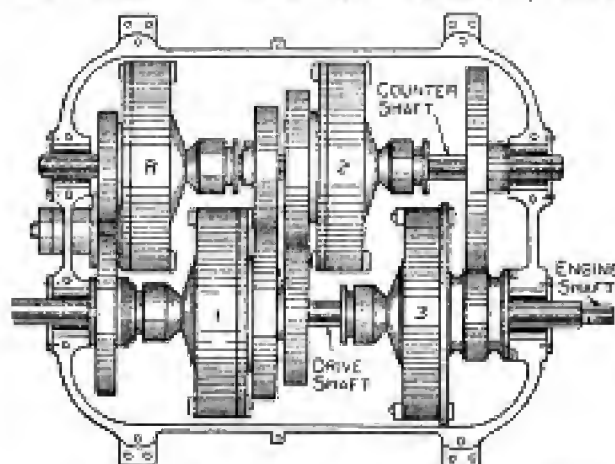


Diagram of New Selective Transmission for Automobiles: The Clutches for Obtaining First, Second, and Third Speeds Forward are Indicated by Corresponding Figures, While the Reverse is Indicated by "R"

being the driving shaft placed in line with the engine shaft, and the other, a countershaft set to one side and geared to the engine shaft. The countershaft runs continuously when the engine is running, while the driving shaft runs only when one of the four clutches is in action. The clutches are of the type in which a friction band works over a disk mounted on the shaft, and by means of a single control lever any one of the clutches may be made to revolve with its shaft or to float on it, as required. The third, or highest, speed is obtained by tightening the clutch that connects the driving shaft with the engine shaft, and the drive is direct when this clutch is in action. The first and second speeds are obtained by tightening clutches on the driving shaft and countershaft respectively, each of these clutches being connected with the other shaft by gearing. The drive is reversed by tightening the clutch at the rear of the countershaft, this clutch being equipped with a gear that connects with the driving shaft through an intermediate pinion.

CA one-cent fare is charged on a new street-car line running from the public square to the passenger docks on the lake front at Cleveland, Ohio.

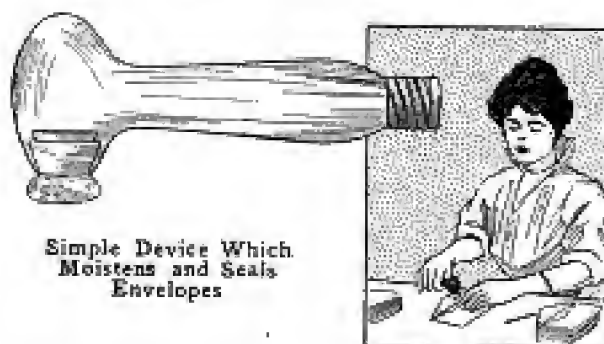
KEROSENE IS EMPLOYED 67 TO FIGHT FIRE

To use kerosene as a fire extinguisher seems paradoxical, yet this was recently done at Calexico, Cal., when a large pile of baled cotton became ignited. There are few fires more difficult to combat than one of this kind, for the material is so tightly packed that water is exceedingly slow in penetrating it, the result being a smoldering fire that is able to eat its way into the middle of a bale which may even be submerged in water. When the fire in question was discovered a quantity of oil was poured over the burning bales. Because it is able to penetrate quickly and thus shut off the air from the interior of the bale, the kerosene readily put out the fire. To recover the uninjured cotton it was then only necessary to open the bales, remove the scorched part and allow the oil to evaporate from the rest.

8190 —

DEVICE FOR MOISTENING GUMMED SURFACES

Designed for either office or personal use, a convenient device for moistening and sealing envelopes and attaching stamps or stickers to them, is made of glass. It is constructed in the form of an ordinary dauber, excepting that it is hollow and contains the water which dampens the felt moistening surface. When in use it is passed beneath the flap of an envelope over the



ungummed surface, the reverse side in turn being used for sealing. When additional water is needed, the handle is uncorked and the device refilled.

The Engineer,
May 21 1915

POPULAR MECHANICS 627 W. 113 St. 435
N. Y. C.

13 USE OF ELECTRIC TAXICABS GROWING NOTICEABLY

Electric taxicabs are gradually coming into more general use in this country. The reason ascribed for this is that experiments have shown that the expense of operation is considerably less than in the case of the gasoline car, while there is also the additional advantage that it affords faster and easier acceleration, which is of importance in crowded city thoroughfares. Several electric machines have been placed in service at Detroit by one company which, it is reported, intends both to increase greatly the present number there and shortly place large fleets of similar machines in use at New York, and other big cities.

128

HUNTING FOREST FIRES IN A FLYING BOAT

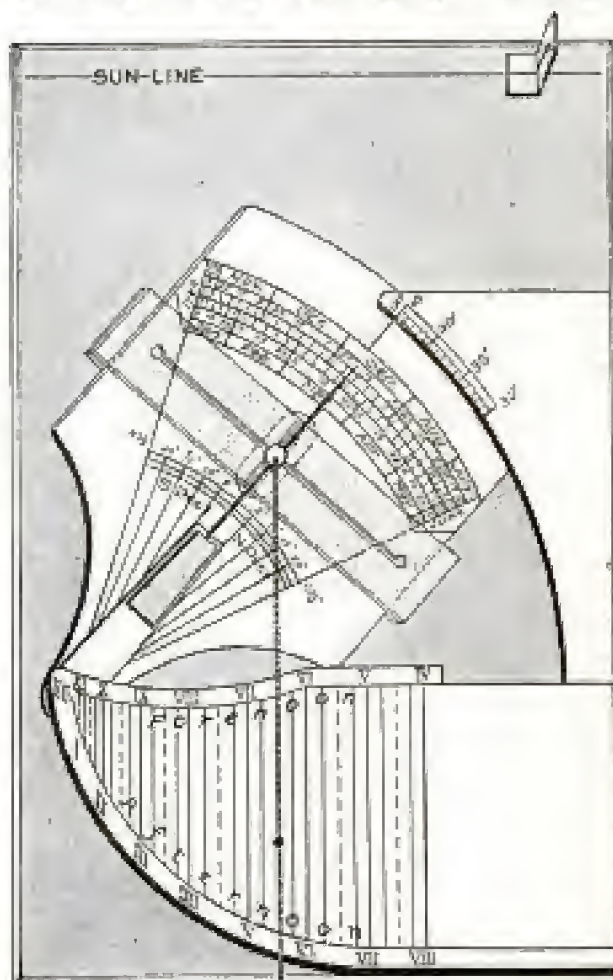
Chgo. Herald.
June 28 1915
Forest fires in the woods of northern Wisconsin are now hunted by an airman who travels in a flying boat. Heretofore the view a ranger had of the surrounding forest was limited to that given from the top of a 60-ft. tower. The airman recently discovered a fire 30 miles away and gave its location and extent accurately. An additional advantage of the flying boat is that it can reach the scene of a fire within a few minutes where hours would be required by the forest ranger using ordinary means of travel.

9674

NEW SUNDIAL DESIGNED TO BE HELD IN THE HAND

With a new sundial that is designed to be held in the hand and is adjustable for any latitude it is possible to tell the time of day with a fair degree of accuracy as well as to determine the times of the rising and setting of the sun for any day of the year. In using this device the movable segment is first set for the latitude, the pointer is set for the date, and a simple adjustment is made for the bead carried on a weighted string that hangs from a but-

ton mounted on the pointer. Below this adjustable portion is a fixed scale consisting of vertical lines and marked above and below with the hours of the



forenoon and afternoon respectively. Across the top of the mounting is a line marked "sun line," and at the right-hand end of this line is an upright slotted tab. With all settings made, the user stands with the right side to the sun and holds the dial so that the sun shines through the slot and along the "sun line," with the string hanging free. The vertical line over which the bead hangs with the dial in this position, in connection with the hour figures marked above or below, indicates the time of day. As the sunlight is horizontal at sunrise and sunset the time of the rising or setting of the sun for any date is found by setting the pointer for that date and then holding the dial vertically so that the string hangs parallel with the lines.

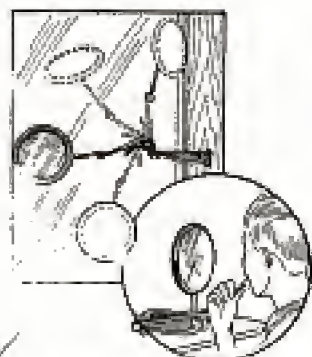
*Invention: W. Heineck,
23-40th New York City.*

NOVEL AND PRACTICAL THINGS FOR THE HOME



Two-Flavor Ice-Cream Freezer

The can is divided into two separate compartments by a partition, over which fits a double dasher. The scrapers work back and forth, as does the operating handle.



Adjustable Mirror for Toilet

Provided with a flexible-arm mounting, that allows it to be adjusted at any angle, a mirror is made which is equally convenient when removed from its bracket and used on a dressing table as it is when employed as a shaving glass. Its fixture swings in a circle having a 42-in. diameter, and may also be either raised or lowered. When taken from its wall socket, the arm folds, forming a standard that permits the mirror to be used on a table.

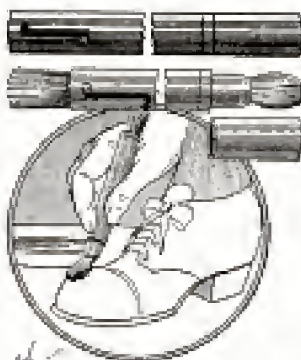


Two-Surface Gas-Heated Iron

Two working surfaces are provided with a gas-heated flatiron which has been introduced. At the point where the irons meet, forming an angle, is a single-burner tube so arranged that its flame acts only upon the surface held upright. When one side becomes slightly cooled, the iron is

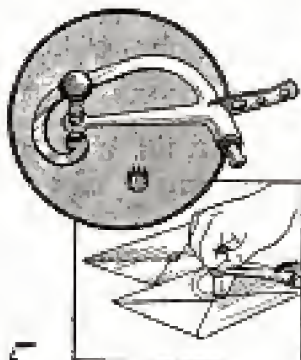
turned over and the freshly heated surface is used.

Certain convenient features for the traveler are embodied in a shoe-dressing device lately invented. It is compact, holding brush, dauber, and blacking, and is made somewhat after the plan of a fountain pen. When extended for use, the liquid feeds through a valve and moistens the dauber.



Compact Shoe-Cleaning Device

Letter seals which cannot be removed without tearing the envelope on which they are secured are being used abroad. They consist of small metal disks supplied with sharp prongs which are bent at right angles when applied.

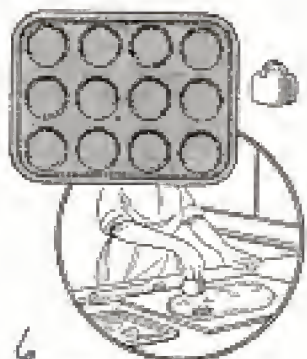


Metal Seal for Private Letters

making a special baking tray has been designed provided with a dozen shallow depressions in which the dough, cut to fit the spaces, is placed. Biscuits thus separated rise evenly and are browned nicely on all sides.

A small, portable electric heater which is intended to be attached to a

For biscuit



Biscuit Pan with Depressions

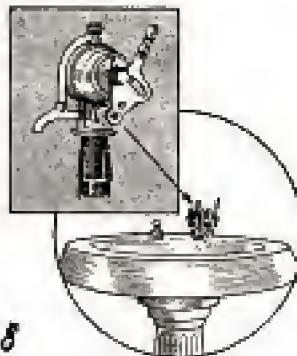
wall fixture or chandelier for use on damp, chilly days, has been designed. It is 10 in. in length, 6 in. wide, and $1\frac{1}{4}$ in. thick, made of nickelplated steel and provided with a reflector which drives the heat downward. When not needed it can be stored in small space.

Something quite out of the ordinary in the way of instantaneous water heaters has recently been introduced in the form of an electric faucet which makes the double piping of a house unnecessary. A pull on a small lever supplies cold water, a turn of a switch makes it steaming hot. The device may be regulated so that water of nearly any desired temperature is available.

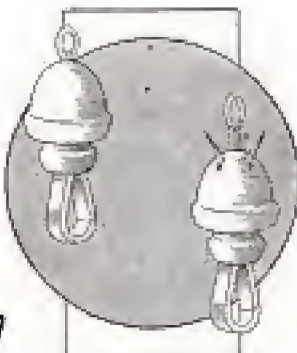
To safeguard against the theft of a watch, a guard has been designed which makes the pick-pocket's work difficult. It is a small, acorn-shaped device which fits between the watch and its chain.



7 Portable Electric Heater for Home



8 Electric Faucet Heats Water



9 Guard Prevents Theft of Watch

so as to make inexpensive cuts of meat tender, an instrument has been in-

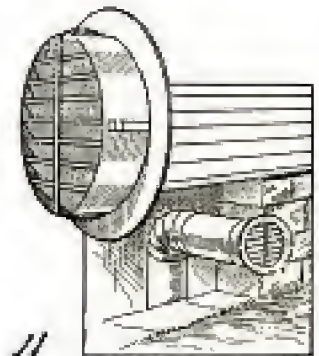
vented which does the work without bruising or "bleeding" the flesh. It is provided with approximately four dozen sharp wire blades. The device is easily cleaned by placing it under a water faucet and applying a brush to it.

Brass-mesh strainers, made to fit tightly in the outer opening of a cold-air duct, are being made to prevent dust and dirt from being blown into furnace pipes from the outside. The devices are made entirely of metal and so arranged that the screens may be removed without difficulty for cleaning.

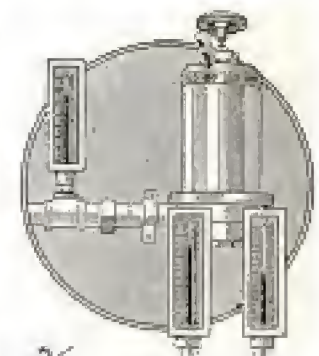
To control the temperature of water for shower and tub baths, and similar purposes, a mixing device is used which provides a flow at any temperature wished. By setting an indicator to correspond with a certain degree, water at that temperature is immediately available. Water issuing from the hot and cold pipes meets and passes through thermostatic coils. These are affected by the combined temperatures and cause a thermostat to adjust valves automatically so that the water is mixed in the proper proportions. This does not affect the volume of the flow of the water.



10 Device Chops Fibers in Coarse Meat



11 Air Strainer for Furnace Duct



12 Water-Temperature Control Device

SITES FOR SUMMER HOMES IN 9987 FEDERAL FORESTS

To promote a more general use of the national forest lands for summer home and recreational purposes, a Federal law has been put into effect which allows the leasing, at nominal fees, of tracts of ground of not more than five acres for periods up to 30 years. This plan replaces that hitherto in effect which provided for the issuance of revocable permits. Because it was impossible under that system for an individual to be certain of the duration of his tenure, many persons showed restraint in making material improvements on the grounds they held. It was largely because of this that the present law was made. The term permits now granted necessitate the yearly payment of fees ranging upward from \$5, according to the location of the ground selected. Persons anticipating making improvements not in excess of \$1,000 are able to obtain land permits from district foresters which are effective for 15 years. Other leases must be approved at Washington. When land is to be used for hotel or resort purposes, the application is accompanied by the plans, specifications, and estimated cost of the buildings to be erected and improvements to be made.

A German inventor has devised a safety attachment for a gas cock which lessens the danger when a rubber-tube



which there are side outlets for the gas is fitted into the end of the cock, while a swelled piece with a recess in the end slides along it. It is over this latter member that the rubber tube is placed. A jerk on the hose which might pull it from the cock, or loosen it sufficiently for gas to escape under ordi-

¶The Aero Club of Pennsylvania, through the permission of the Secretary of the Navy, now uses a section of the Philadelphia Navy Yard as a landing place for aeroplanes.

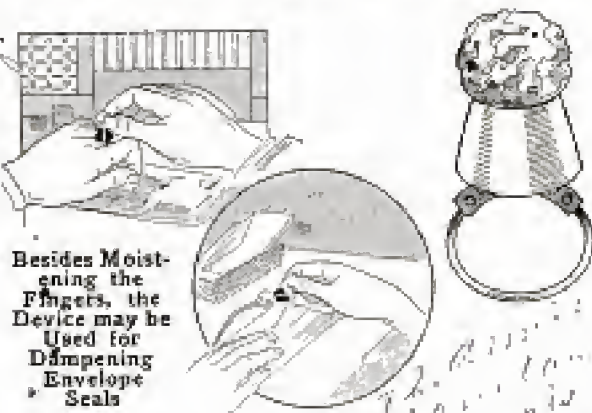
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cont: W. L. Blair, Pasadena, Calif.
1299 N. Wilson Ave.

nary conditions, draws the concave end of the sliding member over the openings in the first-mentioned pipe, shutting off the gas.

SPONGE RING IS MOISTENER FOR FINGER TIPS

For moistening the finger tips readily to facilitate the handling of bills or papers, a ring-shaped device has been invented which, when in use, is intended to be worn on the third finger. It consists of a ring carrying a metal cup which holds a small sponge. It is held in the palm of the hand so that it may be touched easily by the thumb and index finger when it is wished to



Besides Moistening the Fingers, the Device may be Used for Dampening Envelope Seals

moisten them. The sponge carries sufficient moisture to last for some time before it is necessary to redampen it.

HUNDREDS OF COMBINATIONS POSSIBLE IN NEW LOCK

In France an inventor has recently produced a lock which is capable of being changed at will into any one of 10,000 combinations. The inner construction of the device is intricate, but so formed that by altering the web arrangement of the key its locking tumblers may be set to conform to any desired outline and respond to no key of dissimilar detail. There is a longitudinal slot in the stem of the key carrying the individual teeth which by loosening the thumbscrew may be moved transversely. To alter the combination of the lock the key is inserted into it and given one turn. It is then removed and the structure of its web

changed, whereupon the key is again inserted and given a second turn. In making this last turn the tumblers in the lock conform to the new shape of the key and lock themselves to its out-



The Key Used with the Variable Lock Recently Produced by a French Inventor

line, thereafter responding only to it, but upon being turned over once always come back to neutral to the extent that they are ready to be subjected to a different key arrangement.

LIGHT SHIELD DIMS THE OTHER CAR'S HEADLIGHT

A new attachment for automobiles is a light shield supported on the column of the steering wheel in such a position as to protect the eyes of the driver from the glare of the headlights of an approaching car. This shield consists of a series of screens separated by narrow vertical openings. It is carried on a support having two pivot connections so that it may be pushed slightly



Adjustable Light Shield Protects the Driver's Eyes from the Headlights of an Approaching Car



out of the way and returned to position quickly, or folded down along the column of the steering wheel for daylight driving.

The Patent Device Co.
Lock Box 2623,
Boston, Mass.

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Heller & Co. 1919

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*Mfr. The Puffer Mfg. Co.
51 Portland St., Boston, Mass.*

*Mfr. The Parker Pen Co.,
1126 E. Douglas Ave.,
Wichita, Kan.*

*Mfr. Berger Bros. Co.,
Philadelphia, Pa.*

COMPACT TUMBLER WASHER DOES WORK QUICKLY

A mechanical tumbler washer intended for use at soda fountains, and similar places, where a large number of glasses are used and little opportunity afforded for washing them by hand, is constructed compactly, so that it may be employed in a very limited space. It consists of a bowl-shaped container, or basin, in the bottom of which is a rose jet and drainpipe. The water-



inlet pipe is fitted with a plunger which is released by the pressure of the wrist upon it as a glass is placed in the basin. The water from the center jet cleans the inside of the tumbler, while that issuing from perforations in the outer wall of the bowl washes the exterior.

NEW ROOF SHOE KEEPS SNOW FROM SLIDING

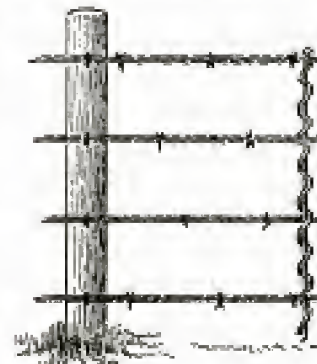
One of the greatest dangers from snow on roofs of large area is the sliding and bunching of the snow on a small area near the bottom, with the result that the one part of the roof is not only overloaded but is in danger of leaking, when thawing occurs, through the action of the water in working under the joints of the roof covering. A new device designed to take the place of the snow rails, or gutters, ordinarily used to prevent this, consists of an up-standing shoe attached to the roof by an iron strap, as many of these shoes being spaced over the roof as may be



necessary to hold the snow where it falls. The shoe is made with various kinds of straps to suit the different kinds of roofs.

STAYS PREVENT SAGGING OF WIRE FENCES

To keep barbed-wire and similar fences from sagging between the posts, a stay has been invented which apparently serves its purpose adequately. It is made of a long piece of wire bent double, hairpin-like, with one end twisted spirally about the other, which remains straight.



At intervals there are small loops through which the fence wires may pass. The top of the device is looped while at the bottom are the two free ends of the wire. In placing it on a fence, the top loop of the latter is straddled by the forked end of the stay, which is then pushed down like an auger, the lower fence wires being inserted between the two prongs as they are reached. The operation requires only a moment's time, so that several hundred of the stays may be put in place in one day.

NEW FOUNTAIN PEN HAS TRANSPARENT BARREL

In a new fountain pen one end of the barrel is made transparent so that it is possible to see the ink as it flows toward the point. The advantage in this arrangement is that it enables the user to see when the pen needs filling without waiting for it to run dry.





Spark Test for Steels

By NEIL W. FRENCH

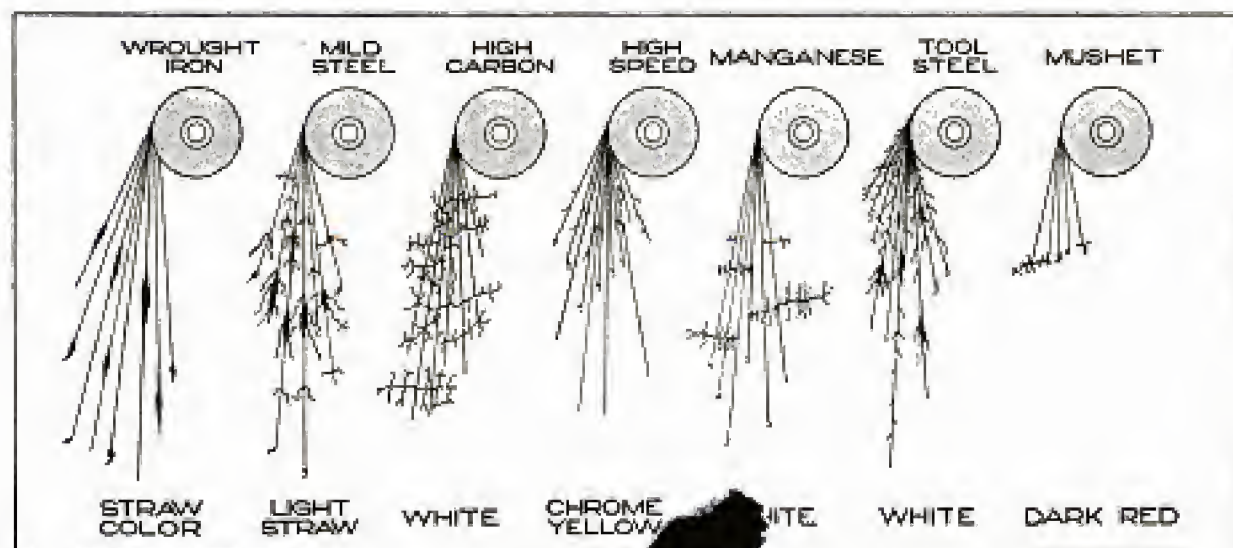
MANY times during the day, in almost every shop, there arises the necessity to judge accurately and speedily the grade, or carbon content, of a chance bit of metal. Especially is this true where a considerable scrap heap accumulates, from which the workman, searching for an odd piece to fit an emergency, could satisfy his wants if he had some knowledge of just what kind of iron or steel he had in hand. For this purpose the spark test, as charted below, is unerringly accurate, and is always quickly available.

Of course, it must be admitted that veterans in the service of the machine shop many times are able to tell the composition of a piece of metal by the "heft" or the "feel" of it; or by some other more or less intuitive sense which one may acquire by long experience. Although many times in the right, a decision by this method cannot entirely satisfy a critical work-

man, or prove reliable in an unfamiliar case. Furthermore, it generally falls to the lot of the apprentice or the unskilled helper to run to the scrap heap for the desired piece. The judgment of this person is entirely untrustworthy, and he should be given a sure and definite system of selecting the metal.

The spark test answers all the requirements to a marked degree. The variations in the sparks from the different metals, when held to a grindstone, are pronounced and easily evident to the veriest novice with the aid of the chart. To the man of experience, the spark test forms a prolific field of study, as the appearance of the sparks follow closely any change in the constituents of the metal, and with close observation, the qualities of the iron or steel may be told with a high degree of exactness.

Another point in favor of the spark test is its ready availability. Other



The Variations in the Sparks from the Different Metals, When Held to a Grindstone Are Pronounced and Easily Evident to the Latest Apprentice with the Aid of the Chart

accurate and definite methods of test, the fracture test and the chemical analysis, involve a large expenditure of time, and in many cases, the mutilation of the piece. A grindstone will be found in any shop, and to touch a small portion of the sample to it requires but a second, and does not damage the piece, as a glance often suffices to decide the quality of the metal. Then, too, comes the added advantage that the apprentice can do the job without wasting the more valuable time of the machinist.

Wrought iron, with its low amount of carbon, gives a straw-colored spark, coming off the wheel in light lines with enlargements at certain points where a particle of iron burns in the air. The lines and sparks are quite regular and quiet, and may be readily recognized. Carbon produces the phenomena which might be expected, a miniature explosion, which sends little white lines at right angles to the heavier iron lines. In the case of the high-carbon steel the carbon sparks overcome the iron ones and the wheel seems to send off a shower of twin-

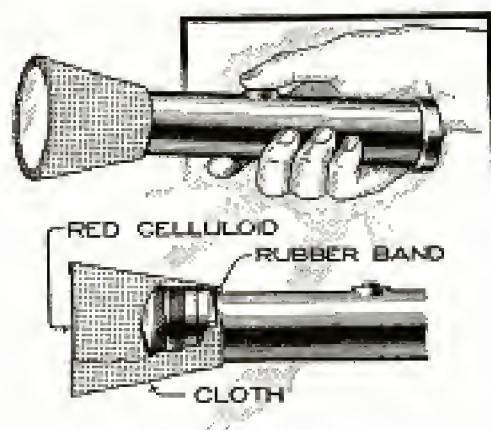
bling little stars, very similar to the "flowerpot" fireworks. These explosive particles are characteristic of carbon.

The alloy steels present quite an array of distinguishing sparks, each varying with the alloy. These may be best studied with the actual known specimens, but some of the more common alloys may be mentioned. Chromium produces a chrome-yellow color, which may be easily recognized after once having been seen. Manganese makes very white lines, with explosions like the carbon, except that the bursts are less in number and apparently more violent. Mushet steel shows a few dark-red lines under the wheel. The harder steels naturally make a shorter spark, and it requires closer observation to become familiar with them.

The chief advantage of this method is its simplicity and adaptability. Each shop is likely to carry standard qualities of iron, and to chart them would be a simple task. Then the latest apprentice could select from the scrap heap the blackest and dirtiest piece of iron and quickly tell its qualities.

An Emergency Ruby Lamp for Photographers

A railway photographer, securing pictures of the manner in which the engineers were placing a certain man-



A Light-Proof End Having a Piece of Red Celluloid is Fastened over the Flash-Lamp Bulb.

ufactured tiling, found that the ordinary camp life provided no dark-room

facilities, which is necessary in transferring the plates and loading the plate holders, as the exposed plates were sent to the city for finishing. A piece of light-proof hood canvas served the purpose of the field dark room, but the dark lantern was provided for in a manner which can be applied in many ways.

A circular piece of red celluloid, about $1\frac{1}{4}$ in. in diameter, was glued to a strip of light-proof focusing cloth, cut in the manner shown in the sketch. The outer end of it had an elastic band which was slipped over the lens of a small electric pocket torch. The device was very useful on the field, as plate holders could be safely loaded and the exposed plates securely packed at any place where views of interest might be taken. The cap was slipped from the end of the torch after using it as a dark lantern, and carried in the vest pocket.

Fruit Racks for Display Purposes

The problem of displaying fruit as well as keeping it in stock is sometimes a puzzle to fruit dealers, espe-



The Fronts of the Original Fruit Cases, or Boxes, Fitted with Display Racks

cially when bad weather will not permit a display in front of the store, as is usually the custom. This compels the dealer to use a great deal of floor space to display the fruit well on the inside.

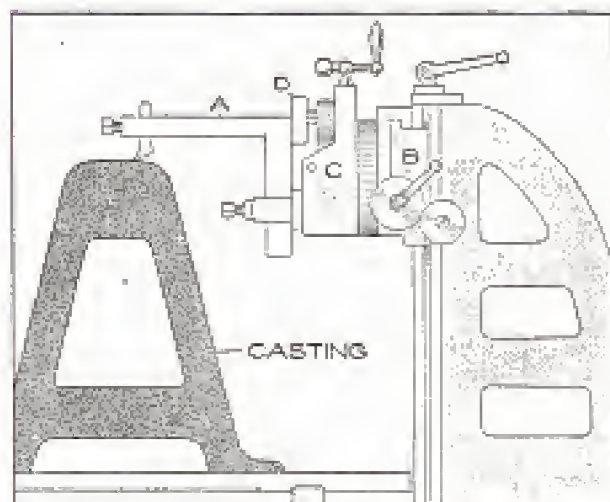
A few racks, as shown in the illustration, will not only take care of the stock, but will display it as well. A rack, fastened to the box as shown, will permit the boxes to be set sideways on top of each other, thus affording a good display for the fruit as well as taking up very little space. The fruit can be handled much easier, and the loss by rot will be reduced to a minimum, as sufficient exposure to the air is provided.

When all the fruit is removed from a box, the rack can be removed and fastened to another box. The end pieces of the racks are constructed of boards 1 in. thick, to which are fastened strips of wood about one inch apart. The strips should be about one inch wide. These may be fastened with nails, or mortised in the end pieces; or they can be made adjustable

by cutting slots in the end board large enough for the pieces to slide in them. In this case pins are placed through the ends of the slats to prevent them from slipping out.—Contributed by Harry Slosower, Pittsburgh, Pa.

Finishing Work Too High for a Planer

A job came along to plane off one face of several castings that were too high to pass under the cross rail of the planer. For various reasons it was not advisable to lay them down and use the vertical feed, so it became necessary to do the work in some other way. They were finally placed in their natural upright position on the planer bed, then an extension tool, A, such as is used for cutting keyways in pulleys, was put in the tool post, but in an inverted position, as shown. With the cross rail B raised to its limit, this tool was just high enough to do the cutting, and it did the work nicely and without special outlay to add to the cost of the work. With the tool thus inverted, it had a tendency to lift and slide along without cut-



Cutting Down the Upper Surfaces of Castings Too High for Regular Planer Work

ting, because the cut caused the clapper to lift about the center C instead of holding it down as in using it in a normal position. This lifting up was prevented by the block D.—Contributed by Donald A. Hampson, Middletown, N. Y.

Electric Water Heater and Time Switch

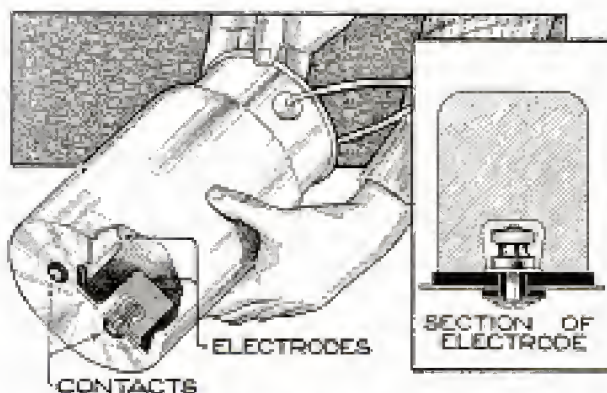
By JOHN D. ADAMS

WHEN boiling water on the usual electric stove or hot plate, the current first heats the resistance wire, then the enamel in which it is imbedded, and finally the outer surface of the iron, top, bottom, and sides. A portion of the heat is conducted through the container into the water; the remainder is all loss. Why not, therefore, use the water itself as a resistance and generate the heat directly in the water and thus practically eliminate all these losses of conduction and radiation?

To apply this principle in its most convenient form, a neat little white-enamel pail of the proper capacity should be procured. For electrodes, carbon suggests itself as the cheapest and most inert conductor. With it rust and corrosion need not be feared, and an ample supply may be had from the center element of a discarded dry cell. Saw off two blocks, flatten the bottom surfaces by rubbing them on a smooth sheet of sandpaper, and then round off and smooth the tops. In the center of the bottom of each, drill a hole with a $\frac{3}{16}$ -in. drill, and then work the drill around at an angle so as to widen the hole at the bottom. This process should be continued until the knurled nut from a dry-cell connection can be nicely accommodated, in the manner indicated in the sketch. The carbon should be heated for some time over a gas or Bunsen flame to burn out all the impurities and chemicals. While this is going on, the brass nut should be tinned all over the outside and the center plugged up tightly with a piece of soft wood. When the carbon ceases to smoke or steam, place the nut in the tapering hole and melt enough solder to fill the remaining space. Arrange some little fastening to hold the nut down until set, as it will float on the melted solder if left alone. When cold, remove the wood plug and clean out the threads.

Having treated both carbons in this manner, a preliminary test should be made to determine the proper distance

apart at which they may be best operated. Fasten them with screws to a hard piece of rubber or fiber, allowing about $\frac{1}{2}$ in. space between them. Connect them up with two pieces of wire having waterproof insulation so that they will be directly across the



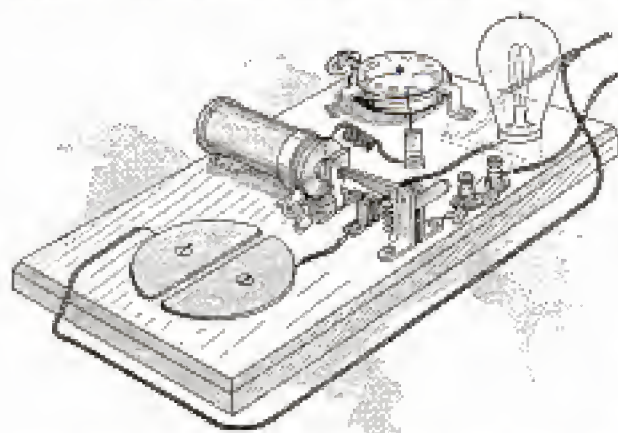
Carbon Electrodes Fastened in a Pail to Cause the Water to Heat by Its Own Resistance

110-volt circuit, placing a five-ampere fuse in series. Completely immerse in water and observe the heating effect. If not sufficiently rapid, decrease the intervening distance to $\frac{3}{8}$ in. and then allow the water to boil before making a further change. If the fuse is not then blown, another reduction may be made.

When the proper distance is determined, two holes are to be drilled in the bottom of the enameled pail, and to avoid chipping or cracking the enamel, they must be drilled in the same manner, as drilling glass, that is, with a piece of brass or copper tubing for a drill, which is fed with turpentine and emery dust. To keep such a drill from slipping around at the start, a piece of cigar-box wood, or hard wax, should be placed over the spot to be drilled. To gain access to the enamel, an ordinary drill may be used, after which the copper tube and emery dust are necessary.

Two large rubber washers and two smaller ones of fiber, all indicated in heavy lines in the sketch, are to be made. The center holes in these should be large enough to receive the brass bolt from a dry cell when covered with a piece of rubber tubing for

insulation. Having cut off two of these bolts to the proper length, place the electrodes and the large washers inside the container and fasten them



Time Switch to be Used in Connection with the Heater for Heating Shaving Water

down tightly, all as indicated in the sketch.

This water heater requires no stove, merely a block of wood with two contact plates. When the water is sufficiently heated, it is only necessary to lift it up by the bail and carry it wherever required—no connecting or disconnecting. If it is forgotten, the water is boiled down, and the circuit is thereby broken and the consumption of the current automatically ceases.

At a predetermined hour the device illustrated turns on the light and heats two or three quarts of water for shaving. The object in having the light turned on is to make it serve in lieu of the disturbing alarm clock, the light alarm being very satisfactory when one is fairly regular in his habits.

All dimensions have been omitted, as they are, for the greater part, either immaterial or else must be adapted to the size of the watch or the heating pail. Most of the parts may be made from such scraps of brass or copper as usually accumulate around the experimenter's bench. For the timepiece, I used one of the standard dollar watches, and for the actuating magnet, a high-resistance coil taken from an old telephone bell. The long hand is removed from the watch and the watch secured in place by means of three brass fingers, which are screwed to the

baseboard and are so shaped that they permit the watch to be rotated in a horizontal plane about a third of a turn. A narrow strip of copper foil is next arranged so as to overhang the face of the watch and intercept the hour hand once every 12 hours.

The coil with its iron core is then fastened to the base block by means of a bracket at the rear and a narrow band in front, or in any other suitable way that will suggest itself. The armature consists of a small soft-iron block, pivoted to the base at the lower edge and provided with a small projection on its back for the purpose of holding up the switch blade. A light spring holds it back from the magnet and a stop keeps it from going farther back than indicated in the sketch. The blade consists of a small strip of brass or copper swung in a suitable standard and provided with a tension spring that will cause it to drop, when the armature is attracted, into a U-shaped contact below. As the carrying capacity will only be from three to five amperes, the U-shaped connection into which the blade drops should be of light spring brass or copper. By providing the blade with a small handle, shown projecting upward at an angle of 45 deg., the timing feature may be thrown out of action by depressing it, in which position the tension spring will tend to keep the blade up instead of down.

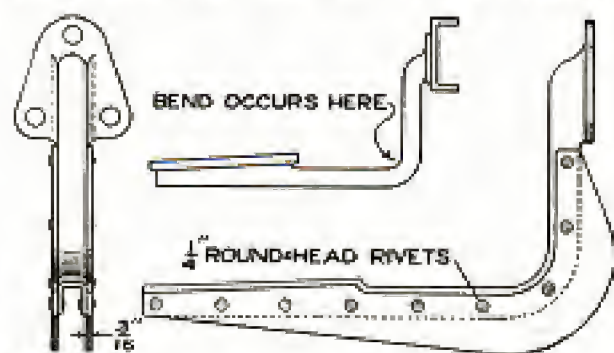
For the heating contacts, two semi-circular plates are secured in place with countersunk screws and at such a distance apart that it will be impossible for either of the contact screws on the bottom of the pail to short-circuit them. For holding the lamp, a neat-trimmed hole will answer every purpose, if the base is of hard wood. The center contact may be made by means of a spring from below, while a small strip of metal, or piece of wire, bent over the edge into the hole will make the outside connection. If the lamp base fits closely, a decided screw action may be had, even though no threads were made in the wood. Two brass bolts from discarded dry cells,

let up through the bottom of the base, will make a satisfactory fuse block if a piece of heavy mica is placed on the wood before the nuts are screwed down.

The method of operation is simple. Connection is made with the watch through one of the three fingers that hold it in place, and as soon as the hand makes contact with the overhanging strip the current passes through the coil to the armature and into the switch blade. The instant the magnet coil operates, it breaks its own circuit and the blade drops into its contact piece below and closes the circuit through the heater and the lamp. The flash of alternating current through the watch does not affect it in any way. All connections are indicated in the sketch and may be readily concealed in grooves cut in the bottom.

Bracing a Strained Running-Board Bracket

The bracket supporting the running board of an automobile was strained, and the board started to sag to one side very badly. To replace the bracket with a new one was quite a job, as it was fastened to the frame with rivets. In making the repair, two pieces were cut from $\frac{3}{16}$ -in. sheet steel to the proper shape, which were then riveted to the bracket, as shown. The reason for making the portion at the bend very large was that this part of the bracket

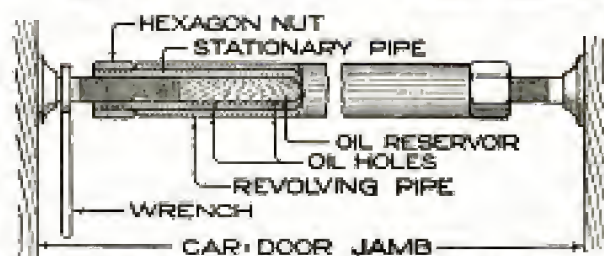
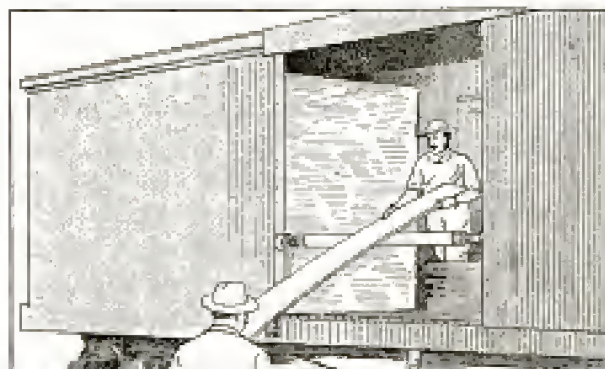


Strips of Sheet Metal Placed on Each Side of the Bracket to Reinforce It

carried the greatest strain. The job, while it entailed a little work, entirely eliminated the trouble.

Jack for Unloading Lumber from Car Doors

In unloading cars of lumber, the boards must be slid out of the doors no matter whether they are loaded on



A Revolving Sleeve Placed between the Jamb of a Car Door for Rolling Out Boards

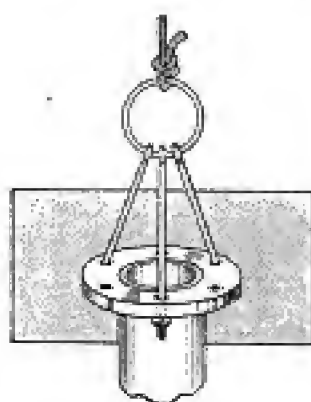
trucks or on a conveyor. The sliding of the boards is not easily accomplished, and in a close place a person finds it quite difficult to shove the rougher material over the edges of the other boards to get them out of the car. Where a large quantity of lumber had to be taken from the cars, a jack was made as shown for rolling the boards out of the door.

The jack is adjustable so that it can be set in any-width door and at any height. It consists of two screw ends, with right and left threads, fitted into the threaded ends of a pipe. Another pipe is fitted loosely over the first one so that it will revolve freely. To keep the revolving pipe from slipping endways, nuts are turned on the ends of the stationary pipe. It is readily seen how this jack may be quickly fitted in the car door to provide a moving surface over which the boards are easily pushed.—Contributed by Frank P. Reidhaar, Connersville, Ind.

Ⓒ In setting a pulley tighten all bolts alike.

Substitute for a Hook to Lower Pipe

Having some heavy pipe to lower into a shaft to a mine, I rigged up the device shown. It

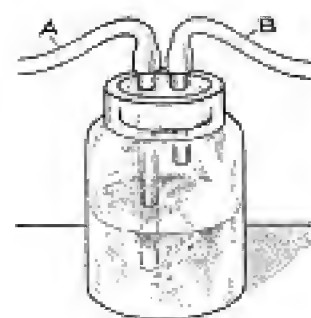


was made of $\frac{5}{8}$ -in. iron rod. The threaded ends were placed in the holes in the pipe flange, and nuts turned on the under side. Locknuts could be used to insure greater safety in lowering the pipe. For very

heavy pipe, heavier material than $\frac{5}{8}$ -in. stock should be used. The lowering rope was attached to a large ring at the top.—Contributed by H. V. Olson, Hibbing, Minn.

To Prevent Gas Explosions

Acetylene and other gas explosions are sometimes caused by the flame following the gas in the tubing back



to the generator, or tank, and there exploding the stored-up gas, causing considerable damage. This is especially true when starting a new plant in which there is a

proper mixture of air and gas to cause this "back-firing." Pure gas cannot be exploded in a tank. In order to prevent an explosion from this cause, the device shown should be connected between the supply and the burners, as near the generator as possible.

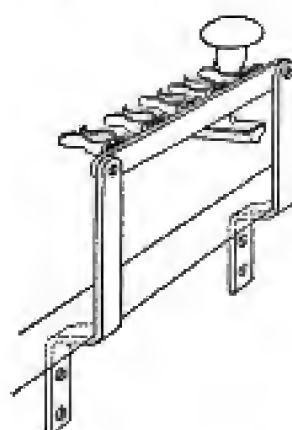
The tubing A is connected to the generator and to a tube passing through a hole in the cork of the bottle almost to the bottom. The tube B supplies the gas to the burners and is connected to a short piece of brass tubing just passing through the cork. The holes are drilled through the cork

with a thin-walled tube that has been sharpened from the outer edge, so as to make the tubes fit tightly and prevent the gas from escaping. The bottle is filled one-third full of water; then the cork is inserted and the tubes squeezed in tightly, with the long tube immersed in the water.

The gas is forced through the water and then it follows the tube B to the burners. If the flame follows the tubing it cannot pass the bottle, as the water stops it and thus prevents an explosion.—Contributed by Chas. I. Reid, Millersburg, Pa.

Rubber-Stamp Rack

A simple and convenient rack for supporting rubber stamps on a flat table-top desk can be made as shown in the illustration. Two angle brackets



of metal strips, about $\frac{1}{8}$ by $\frac{1}{2}$ -in. stock, are made with one end about 2 in. long and the other about 5 in. The short ends are drilled for screws to attach them to the lower side of the table top. The long ends are

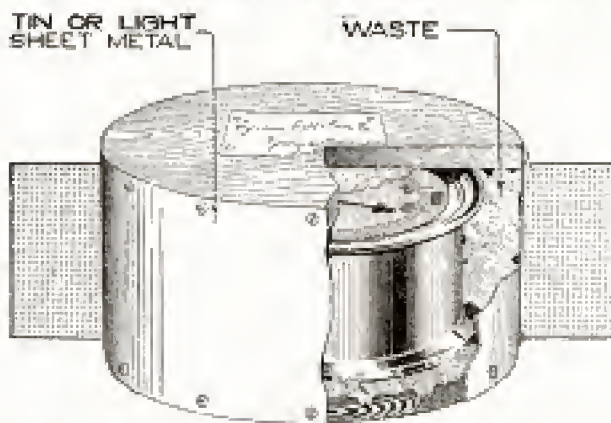
drilled near the top for fastening the stamp rack. The rack can be bought in any suitable length from a local stationery or hardware dealer, and, after being provided with a hole at each end, can be attached to the upper ends of the angle brackets with small stove bolts, or wire. The assembled rack may then be fastened in the place selected for it on the table. With this arrangement, any desired number of stamps can be provided for.—Contributed by C. Currier, Port Elgin, Canada.

¶An all-steel wheelbarrow makes a good place for a fire on contract plumbing jobs. It can be taken to the spot where the melted lead is wanted.

Boxing Pressure Gauges for Shipment

It is the custom of a great many establishments having numerous pressure gauges in the various power plants to send the gauges to a central point, or shop, for repair and adjustment. It is, of course, necessary to properly box, or crate, them to prevent damage through rough handling in shipment, and it takes considerable time to make boxes suitable for one or two gauges at a time.

The sketch shows how an inexpensive and permanent shipping box can be made for the gauge, which can be used many times, even for gauges of varying thickness and diameter. The round top pieces are of wood, to which is tacked the side piece or circular strip of tin. By packing a little excelsior or waste around a small gauge it can be sent in the same box. All that is necessary is to bend over the



A Quickly Made Packing Box to Hold and Safely Carry a Pressure Gauge

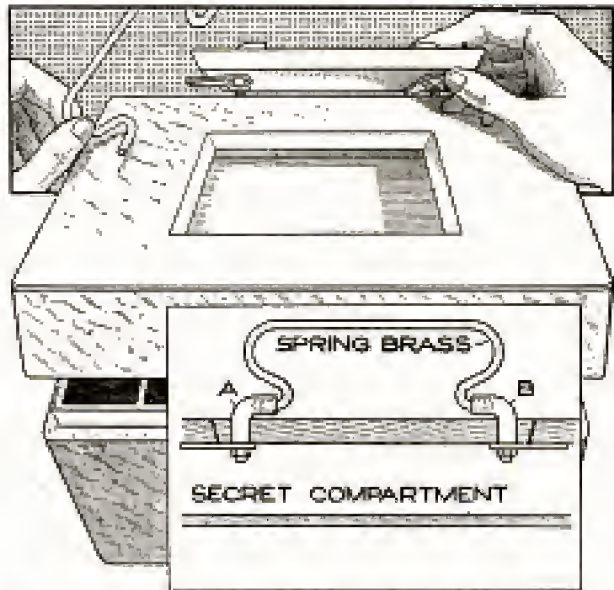
tin sides and fasten them, and the gauge is ready to ship. One or two of these kept on hand in the plant will be found very convenient when a gauge suddenly requires shipment to the central point for repairs.

Handle Lock for Secret Compartment in Fancy Box

An ingenious opening and locking device, made in a cover of a fancy jewel box, is shown in the illustration. The handle of the box constitutes the locking device. The handle holder B is made to turn in the secret cover, its

under side having a brass extension that passes under the box cover and holds the secret cover firmly in place.

It is only necessary to press the

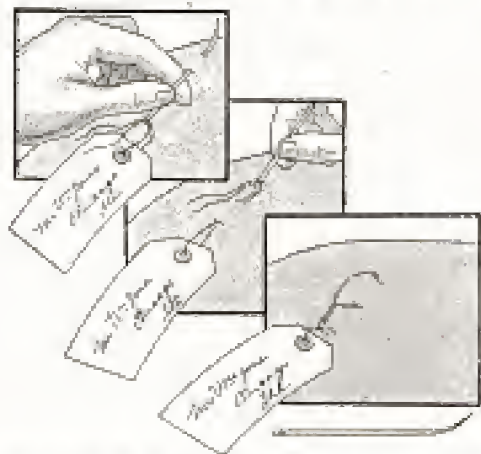


Secret-Compartment Cover on a Fancy Jewel Box Locked by the Handle

handle ends out of the holes in the holders A and B, turn the piece B until the lock piece clears the cover top, then the secret cover is free to be lifted away from the box cover.

How to Tag Bags

A quick way to tag bags is to run the wire, or string, through an ordinary sack needle, then drawing it through the bag and tying it. This

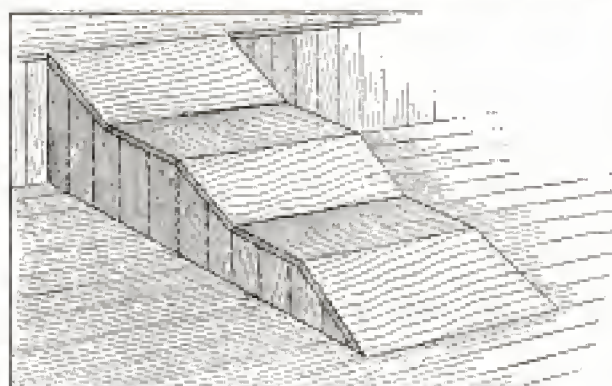


The Sack Needle is Threaded with the Fastenings of the Tag, Then Run through the Sack

is much easier than working it through with the fingers.—Contributed by Louis Wahrer, Tiffin, O.

Warehouse Steps for Trucks

Steps used in warehouses or places where one floor is only a few feet above another floor are usually bother-

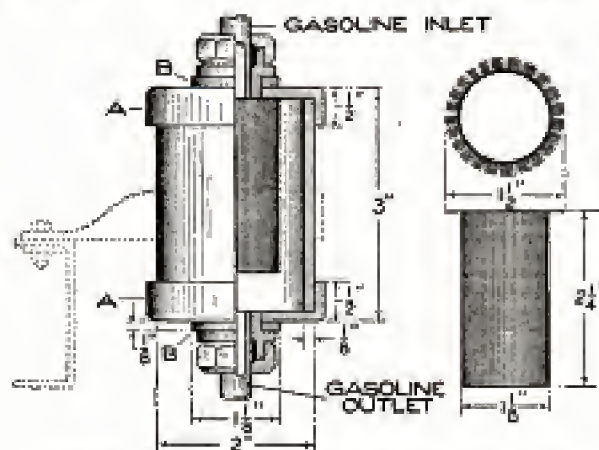


The Rise on Each Step is Made Slanting with a Width Narrower than the Tread

some, for in such a place trucks are used to cart large objects from one point to another. In a certain warehouse where the steps were used as much to walk on as for the trucks, the owner made the rise as shown in the sketch. The rise on each step was made slanting so that the wheels of the trucks would run over them.

How to Make a Gasoline Strainer

A good feature to incorporate in the fuel system of an automobile is the placing of a gasoline strainer in the line between the tank and the carburetor. Those who wish to install a strainer



Gasoline Strainer Placed in a Pipe Line on an Automobile to Catch Particles of Dirt

and are somewhat mechanically inclined will be enabled to construct a

very efficient and at the same time inexpensive one by the following description:

The body consists of a piece of brass, or bronze, pipe, threaded at both ends and provided with a closing plate, A, at either end. These end pieces are ordinary pipe caps and are provided with collars, B, which are soldered to them. The strainer part is made cylindrical in shape, of fine brass screen, and has a flange at its top for the purpose of fastening it to the top cover to which it is soldered. The pipe connections consist of ordinary pipe unions. These unions are screwed into the top and bottom caps, white lead being placed in the threads to avoid leakage. The complete strainer is fastened to the frame side rail with a piece of flat steel soldered to the body and in turn bolted to the frame.

A Flexible Rubber Washer

For a washer that combines elasticity with water-resisting qualities there is nothing to equal one cut from a piece of automobile tire. As it is live rubber, it is almost impossible to cut it with a knife. Use a pair of scissors to cut out the disk, and a belt punch to cut out the screw hole.



Since the washer is very flexible it is best to use a brass, or copper, washer between the screw head and the rubber, as the screw alone will not hold it very well. If the fabric is left on the rubber it will increase the life of the washer.

Lubricant for Tapping Boiler Plates

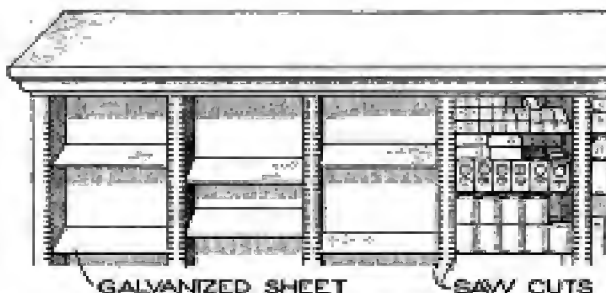
Boilermakers, when tapping sheet-steel plates, dip their taps in a solution of white lead and lard oil, thinned to the consistency of cream. This also makes the best and easiest-cutting lubricant obtainable for tapping in machine steel.—Contributed by Joe V. Romig, Allentown, Pa.

Arm Flash Lamp for Repairmen

In my work at night I have often felt the need of a helper to hold the flash lamp while making a repair. To use the ordinary flash lamp is very difficult when the occasion requires quick action. Having no helper, I contrived to overcome the trouble by placing the flash lamp on my left arm; the front near my wrist, and the back close to my elbow. With two small bands of copper wire fastened around each end and over my arm I can hold the light permanently in instant readiness. In this manner I have the use of both hands and can throw the light on any object at will while I remedy or find the trouble.—Contributed by Max J. James, Collinsville, Okla.

Adjustable Store Shelving

Retail stores, where the commodities are small and many times kept in small boxes or packages like groceries and hardware, can be arranged so that the shelving is adjustable to take any new-size package without the waste of space, as shown in the illustration. The stiles are scored with saw cuts at intervals of 1 or 2 in., and where necessary, they can be spaced every $\frac{1}{2}$ in. The shelving consists of galvanized metal of about No. 16 gauge. By inserting the shelves in the proper saw cuts, the sizes of the various compartments can be adjusted to suit the various packages to be stored in them.

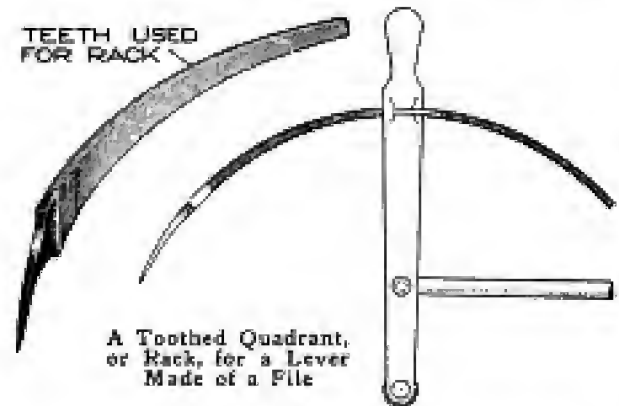


The Thin Metal Shelves Take Up Very Little Space between the Packages

This eliminates the waste space and permits a great deal of material to be stored in a small space.—Contributed by J. J. O'Brien, Buffalo, N. Y.

To Make a Curved Rack for a Lever

In building an experimental device, a lever was to be set in different positions much as a brake is set on an



automobile with a dog engaging a toothed rack or quadrant, only in this case the teeth were to be on the side of the rack. This seemed rather expensive to make, as the rack had to be 12 in. long with approximately 20 teeth to the inch.

The method adopted was to heat a 14-in. file and bend it to the desired curve. This made a rack already cut on the edge with material of the best quality, and the entire cost was the price of the file. In bending, the teeth of the file assumed a position almost radial, as required. With the tang cut off it made an ideal quadrant.

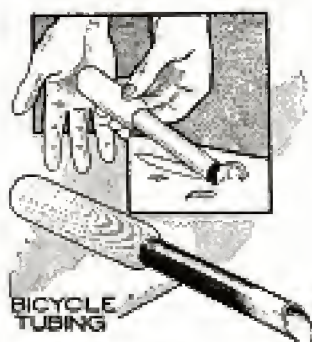
Spikes on Shoes for Roof Workers

A person working on a shingle roof is much safer—in fact he can walk all over a roof of ordinary pitch without fear—with a three-penny shingle, or lath, nail driven through each edge of the shoe soles just outside of the uppers, and one slantingly through each side of the heels. The points should stick through about $\frac{3}{32}$ in., or far enough to stick into the shingles without bending. When through working on the roof, the nails can be withdrawn without injury to the shoes.—Contributed by L. M. Hodge, Wilmington, California.

Do not use a fine file on babbitt metal or lead.

A Wood Gouge

A good emergency gouge can be made from a piece of bicycle tubing, as shown in the sketch. Of course, it will not have the temper of the real gouge, but it will hold the edge long enough to serve in an emergency case. It is only necessary to fit on a wood handle to make it quite convenient for use.

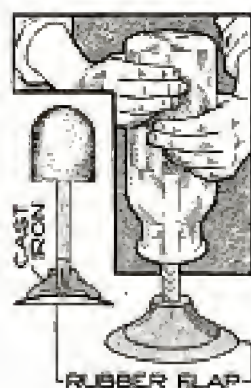


Putting in Water or Lubricator Glasses Easily

When putting in a new water or lubricator glass it is a very difficult job to get the glass through the rubber packing. To make this easy, simply give the glass and rubber packing a coat of machine oil. No matter how tight the packing fits, the glass will slide easily into place. This will prevent breaking many glasses when putting them in the fittings.—Contributed by John P. Kolar, Ithaca, N. Y.

A Bottle Washer

A cheap bottle and glass washer for soda fountains and bars can be made as illustrated. A cast-iron base is

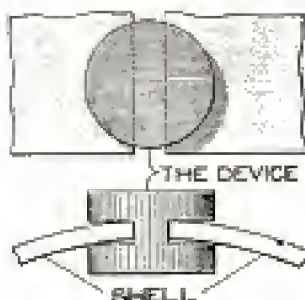


made with a tapered hole, into which is driven the end of the brush handle. This construction permits easy removal of the brush when it is worn out. The bottom of the base is formed cupping and a rubber flap is fastened in it with a screw. With the hollow base and the rubber flap, the washer can be set on the pan of the

washing rack, and the cup-shaped rubber will produce a suction that will hold it in place without any fastening, so that glasses and bottles can be washed without any trouble of disturbing it. The rubber will last for some time and the iron base is indestructible, while the brush may be easily renewed.

Tool to Hold Joint Edges while Welding

In welding the seams of heavy shells, a helper is usually necessary to hold the seams level and apart. The helper uses chisel bars for this purpose and he must be on the job while the seams are being welded. A small and simple device, shown in the sketch, saves the time of the



helper. It holds the seam apart and level and all the welder has to do is to hammer it back as the welding is advanced.

The device is very simple in construction and in operation. It is made of a 4-in. cold-rolled steel bar, about 3 in. long. Slots are milled, as shown, leaving a strip of metal along its diameter. The slots are made just large enough so that it can be easily slipped on the end of the shell. These slots keep the seams from twisting and hold them level. The strip of metal between the slots holds the seam apart.—Contributed by George Marks, York, Pennsylvania.

How to Preserve Reference Tables

Reference tables are very convenient to use, but they soon become dirty and torn in constant use. This may be prevented by dipping them in lacquer. Use a shallow tray, place the lacquer in it and lay in the prints, then remove and hang them up to dry. This makes the paper dirt-proof and also toughens it.

Cause of Water-Tank Explosion

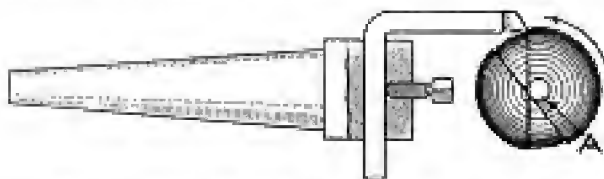
Almost all tanks supplying water to railway engines are so located that they are filled by gravity. For this reason all tanks are similarly built, that is, with a roof, and made practically air-tight with the exception of a vent in the shape of an overflow pipe. In one instance, one of these tanks was filled with the aid of a power pump. During a cold snap the overflow pipe became frozen and very little space was left for the air to escape. The pump was started and a burst tank was the result.

Turning a Ball in a Milling Machine

To turn a ball perfectly round is a very difficult job for any machinist using a lathe, unless the lathe is fitted with a special attachment designed for the purpose. Few machinists know that the job may be easily and accurately done in a milling machine without any special fixtures except to make a simple tool to fit the fly cutter head.

Such a tool is made from a bar of square steel having the proper dimensions to fit the hole in the head, by bending a portion at right angles to the main body to make a cutting tool, as shown. Place the material in the centers so that it is held by the lugs A. The tool is revolved in the regular way and the ball slowly fed around in the direction of the arrow.

A perfect ball can be turned, excepting the center lugs A, which can be easily finished off by hand. The lugs can be turned down very small by the same tool after finishing the other part

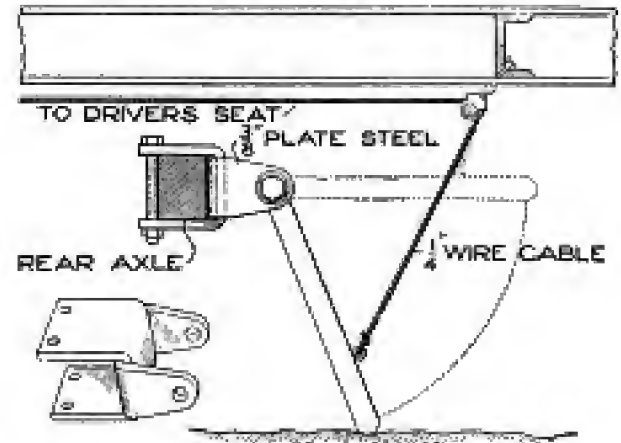


Simple Tool for the Fly Cutter Head of a Milling Machine to Turn Balls

of the surface. It will be readily seen that a perfect ball can be easily turned by this method.—Contributed by J. A. Brearley, Washington, D. C.

Sprag for an Automobile Truck

Considerable trouble was encountered by the owner of an automobile delivery truck, in an extremely hilly



Sprag Attached to the Rear End of an Automobile Truck for Relieving the Brakes

country, in keeping the truck stopped without locking the brakes. This caused a great deal of wear and expense, and some person suggested that a sprag should be installed. The sketch shows the manner in which it was attached. The sprag rod was made of a piece of $1\frac{1}{4}$ -in. cold-rolled steel, and was hinged at its upper end on a U-shaped bracket. The rise and fall of the sprag was controlled by the driver at the front by means of a foot button and cable.

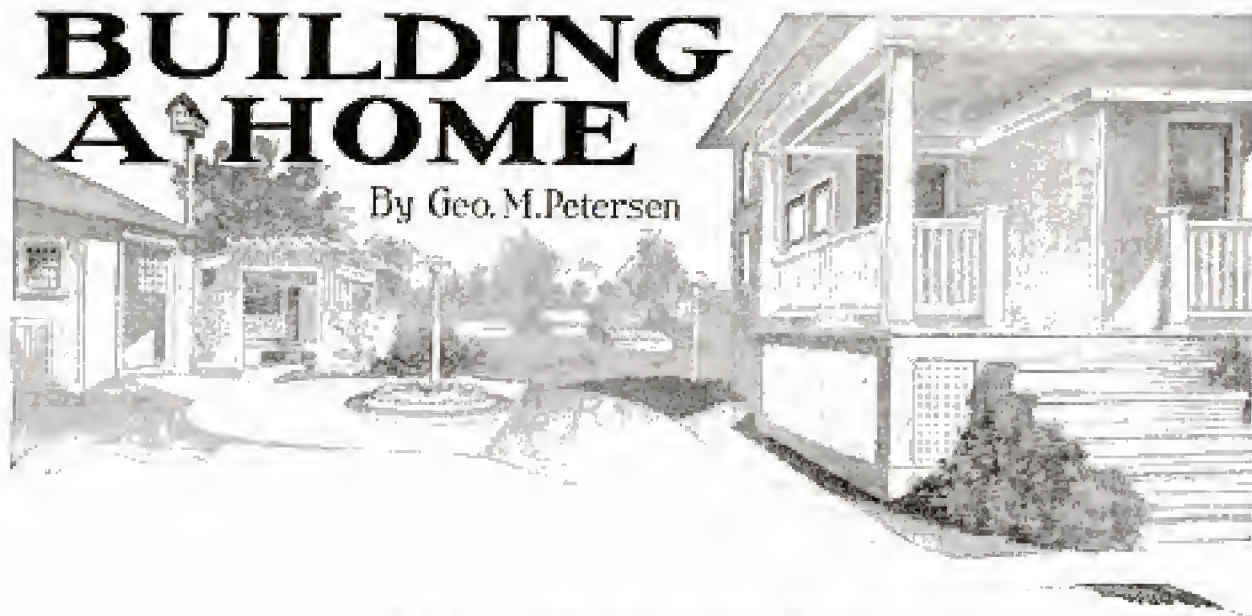
To Blacken Brass

Brass having surfaces that require a dead black can be treated as follows with good results: Heat the brass over a fire that is clear, such as charcoal, and do not allow the sparks to come in contact with it, or else red spots will appear. When the metal becomes slightly red, dip it in nitric acid, then heat again, but not to a red heat. Give the surface a good rubbing with a bristle brush, and clean with a cloth slightly greasy. A fairly permanent dead black will be the result.

When putting up a line or jackshaft, be sure to make a liberal allowance for expansion and contraction.

BUILDING A HOME

By Geo. M. Petersen



PART VI—Construction Hints

WHEN building a home it is advisable to watch everything carefully, as, no matter how conscientious the contractor may be, there is apt to be some fault that must be corrected before the building is completed. The owner must always remember that the contractor probably has six or seven other buildings going up at the same time, so that no one job gets very much of his personal attention, even though he may be very much interested in his work. The foreman who is put in direct charge of the job by the contractor will try every possible means to crowd on speed and clean up the job. This speed is not detrimental to a building, but is sometimes responsible for a slight oversight here and there.

When the owner sees something that does not appear to be right or is not just what is wanted, it is always wise first to consult the foreman and ascertain why the work was done in that way. In most cases the work that appears to be improperly executed is put in because some construction detail requires it. If the foreman's explanation is not satisfactory, it is then time to go directly to the contractor for an adjustment. Do not bother the contractor with every little complaint, as he will probably speak to the foreman who will get "sore" on you, and the contractor will think you a crank and you—the owner—will suffer for it.

The better class of contractors desire to do the right thing, and all that is needed is a little coöperation instead of opposition on the part of the owner. Some owners consider it clever to wait until everything is completed and then make a contractor rip out and rebuild certain parts of the work.

When I say that the owner should watch the work carefully I do not mean the actual construction of the building, but rather the details of it, such as the location of the doors and windows, bookcases, fireplaces, cupboards, and the like, to see that they are properly located, not necessarily as shown on the plans, but in the location which will be the most satisfactory for use. By watching and studying the layout of the building before the plastering is done, it is often possible to change the location of certain built-in features without any additional expense. It is also some satisfaction to the owner in making sure that all work has been done properly. In order to enable the owner to make a systematic inspection of the work while it is progressing, a few points will be mentioned which may be watched to advantage.

Excavating

See that the excavation is large enough to allow loose earth to be tamped or rammed against the mason work of the foundation walls. The

trench should be wider at the top than at the bottom. See that the cellar bottom is not excavated below the rough grade and then filled in with loose earth or clay, as this loose stuff often works up through the cinders and into the concrete of the cellar floor. The sewer connection into the cellar should be made as soon as the excavation is completed, so that no water will remain on the surface. Too great care cannot be exercised in keeping the excavation dry until the building covers it, or until the foundations are all in and set, else they will slide on a slippery bottom.

Mason Work

First be sure that good, solid footings are put in for the foundation walls, and that stone foundations are laid in full beds of lime and cement mortar, with a bond stone running through the wall at least every seven feet in length and every third course high. The footings for the iron stanchions must be large in area, and good and deep, as practically the entire weight of the house is carried on the girder which is supported by the stanchions. The cellar-window frames should be securely set and properly pointed up with spalls and mortar. See that the chimneys and fireplaces are started from a good, solid footing in the basement, and not at the concrete floor, or from the top of the foundation wall. The concrete floor should be laid on at least four inches of well-rammed cinders and at least three inches thick. Be sure to have all chimney flues left clean and not plugged up with mortar or broken brick. All tile and face-brick work should be properly cleaned before the mason leaves the job. Before the plaster is put on, see that all lath are securely nailed and properly spaced, and later that all plaster is put on with sufficient force to insure good, strong clenches. When the plaster is prepared, see that the lime is sufficiently slaked so that it will not ruin or spot the wall paper, and when put on, that the walls are plumb and the angles sharp and clean. The house

should be kept reasonably warm and well ventilated while the plaster is drying.

Carpentry

Be sure that the girder is spliced so that all joints rest on iron stanchions; that joists and studs are sized; that the veranda floor is laid with the ends to the front, and the tongue and groove painted with white lead and oil; that chimneys are properly flashed; that sheathing is of matched stuff; that subfloor, when used, is laid diagonally; that the roof boards are evenly spaced; that the shingles are not laid more than $4\frac{1}{2}$ in. to the weather; that siding laps at least one inch; that the water table projects beyond the foundation walls; that the stairs are properly housed and wedged; that the jambs are set plumb; that the doors fit properly, and are not too small or hinge-bound; that the window sash are properly weighted; that all the casings are securely and properly nailed; that all the floors are properly scraped before being finished; that heavy building paper is used between the sheathing and siding; that deadening felt is used between the subfloor and the finish floor; that flat roofs are covered with tin or canvas; that no trim is put on until the moisture is out of the plaster; that hardwood floors are nailed with either coated or barbed brads; that all base, shoe, panel strips, and the like, are flush and properly coped, or mitered, together; that all lumber is as dry as possible before using; that all interior finish is kiln-dried; that the house is crowned, or raised, $\frac{5}{8}$ in. in the center so that when the house finally settles down it will be level.

Tin Work

All sheet-metal work should be painted on both sides with red lead and oil before putting it in place, and all gutters should be at least four inches in diameter and made of galvanized iron; all conductors should be of corrugated galvanized iron at least three inches in diameter and should connect into a heavy iron boot.

Corrugated conductor pipe is used, as the action of frost and ice has little effect on it, whereas otherwise it would burst around the conductor.

Hardware

All outside lock sets should be bronze or brass, and not steel, and sash locks strong and well put on. Make sure that the sash cord is properly attached to the sash and the weights; that the interior hardware is of the style desired before it is put on; and that drawer pulls, cupboard catches, and the like, are large enough for the service. About the only way to distinguish between plated-steel hardware and plated-bronze parts is by means of a magnet. A magnet will be attracted by steel, but not so with bronze. Of course, steel is all right for interior use, but it is far from satisfactory for outside work and should be avoided.

Painting

Be sure that all knots and sap are covered with shellac; that all siding, outside trim, and frames are given a coat of lead and oil as soon as possible after they are placed; that all exterior work receives at least two coats of good lead and oil paint; that veranda ceilings are given a coat of hard oil, or a coat of stain filler, shellac, and spar varnish; that all interior work is given a coat of stain filler, shellac, and varnish; that floors are given two coats of shellac; that white-enamel work receives at least three coats of flat white before the enamel is applied; that the house is warm and well ventilated while the varnish is setting; that all nail holes, both on interior and exterior work, are puttied after the first coat of paint is applied; that no window glass is cut too short for the sash, and that all glass is properly back-puttied and puttied.

Heating

The horizontal run of a pipe from a hot-air furnace should have as much rise as possible and no more turns than necessary. The smoke pipe should connect directly into the chimney, and if

the house is a two-story family flat building each furnace should have its separate cold-air duct. The risers and returns on a steam or hot-water plant should be covered with an asbestos or mineral-wool jacket, and the boiler covered with asbestos. Always make sure that the boiler is large enough to thoroughly heat the house in the coldest weather.

Decorating

It is considered good policy to wait at least two years before papering new walls. This does not appeal to many persons on account of the white plaster, but if the walls are tinted and then left for a time it will certainly be easier on the paper. If the new walls are to be papered immediately after they are finished, they should be thoroughly sized and a cheap paper put on, or if high-priced decorations are to be put on, the walls should be lined or papered with a thin lining paper and the good paper hung over the lining.

Remodelling an Old House

Many people own old houses for which they cannot get a fair price in their present condition, or, while they do not like the old house, will not part with it for sentimental or other reasons. The only thing to do in such cases is to remodel the building. The average person thinks it will cost too much to remodel, but the truth is that a house can be remodeled and made up to date at comparatively small expense if done in the proper way.

The first thing to receive attention is the veranda. Remove it and put up a modern, up-to-date one, that will improve the looks of the entire front elevation. Then repair the plumbing, installing modern fixtures where necessary. Change the layout of such rooms as may be necessary to modernize the building. Square up the building, lay hardwood floors, wire for electricity, paint the exterior and interior, and redecorate with modern wall paper. Some old houses would look better if a small front addition were put on, while others would be better if moved

back on the lot and a new house erected on the site of the old one.

When building a store, or changing a store front, do not forget about the ventilation in the window to prevent it from steaming in the winter. There are several ways to do this, but the most satisfactory one is to have the ventilation at the top and bottom of the window, and have an air-tight back, to keep the heat from the interior of

the store from coming in contact with the glass.

It is also possible to make property pay better by erecting a cottage or small two-family flat in the rear of the existing house, thereby deriving revenue from the vacant end of the lot. These rear cottages are usually built without cellars or furnaces, and are built cheaply so as to bring the largest possible return on a small investment.

The Selection of Rubber

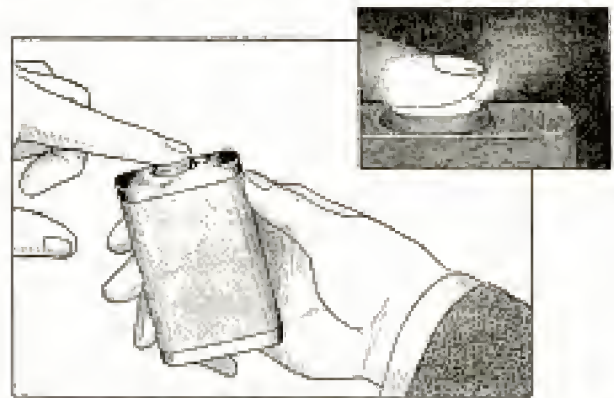
When purchasing rubber gaskets, sheets, molded parts, etc., the quality of the stock can be determined by the water test. Rubber goods having a large percentage of old rubber, impurities, and cheap ingredients will sink to the bottom of a vessel filled with water. Goods made of new or almost pure rubber stock will float. Old-rubber goods are stiffer; new rubber is soft and stretches almost indefinitely without tearing or breaking. For some purposes, as gaskets, the admixture of old rubber and cheapening stock is advisable to give stiffness to the manufactured product. Gaskets made from good rubber will blow out under heavy pressure.

Sometimes a sheet of rubber is wanted for some purpose when none is obtainable. If one is not particular about the quality and only a compressible sheet form is wanted, this may be procured from a newspaper office. The press blanket is made of sheet rubber with a fabric molded in it. The rubber that is discarded as worn out can be purchased cheaply and will answer many purposes as well as an expensive new article.

Pocket Flash Light Used as an X-Ray

In a recent issue I saw an illustration showing how the throat, or mouth, could be examined with the aid of a small pocket flash light. A friend found that he could use a lamp of the same type to locate a small

splinter under the finger nail. A splinter in such a location is found only by guesswork, but by pressing the finger tightly over the bulb of the



A Splinter under the Finger Nail Shown Up with a Flash Light as an X-Ray

pocket light in a dark corner, the splinter will be plainly seen in the pinkish light glowing through the finger nail.—Contributed by James M. Kane, Doylestown, Pa.

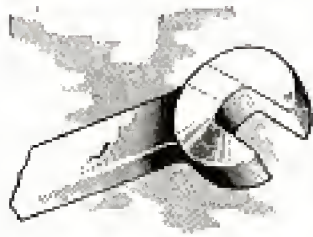
Graduated Eyeglass Set Promotes Bookstore Sales

A proprietor of a bookstore lost many sales to elderly customers that had forgotten to bring along their eyeglasses. He hit upon the plan of having a set of graduated glasses on the sales counter, and when a customer found that he had left his eyeglasses at home, some one of the set would be suitable enough for him to select what he desired, and a sale was made.

It is better economy to keep an emery wheel true and sharp than to let it run off center.

An Emergency "Woodruff" Key

While driving over some very rough country in a car, I had the misfortune to shear off the "Woodruff" key in the drive pinion. Being 30 miles from home, this placed me in a difficult position. In looking through the tools in my kit, trying to think of some remedy, my eyes fell on an open-end wrench, and the shape of one of its jaws gave the idea of making a key, which I proceeded to do by cutting it off on the dotted line. It happened to be the right size and a good fit.—Contributed by Ellis Johnson, Maple Creek, Sask.



A Grind Finish on Rivet Heads Made with a Hammer

A quantity of brass parts were to be put together as shown in the sketch, the shouldered ends of the rods passing through the drilled bars and being headed over. A hammered finish was prohibited, and there was not money enough in the job to rivet and then finish with a set, or to do any hand-finishing after the hammering had been done.

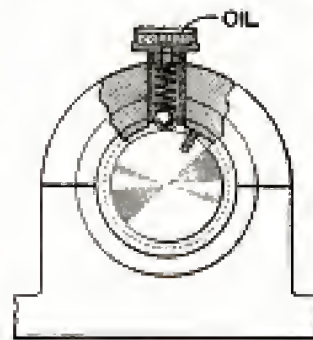


To do the work quickly and make it look neat, a piece of steel was drilled the size of the rods, to be used for a riveting block. The face of a hammer was then ground on a 36-grain emery wheel just enough to leave the marks of the wheel on the metal. This hammer was then used for riveting. When finishing the rivet head, the final heavy blow was made with the ground face so as to obliterate all other marks and leave the imprint of the ground surface. The finished rivet head gave the appearance of a ground surface and proved highly satisfactory.

An Automobile Oiler

The sketch shows an oiling device for use in lubricating general machine bearings which is far superior to any methods generally employed. The oiler cannot fail through any of the common causes, and dirt only gives a better seating for the ball valve. It is readily adjusted, by turning the cup in or out of the pillow block, to flow any desired quantity of oil.

In construction, the bushing is recessed, as shown, the recess size depending on the shaft size. About $\frac{1}{8}$ in. square will be suitable for shafts up to 4 in. in diameter. Traveling in this recess is a slotted headless screw turned tightly into a tapped hole in the shaft.



The ball in the cup stem does not quite touch the shaft and is held firmly in its seat by means of a coil spring, as shown. In operation, the revolving shaft carries the screw around in the groove, the screw at each revolution coming in contact with the ball valve and raising it from its seat so that a quantity of oil flows onto the shaft. When the screw has passed the ball, the latter is then reseated by the spring. The spring is held in place by a bushing tapped into the stem of the oil cup and through a hole in which the oil flows. As the oil reaches the shaft, it is carried lengthways by means of a longitudinal groove.

When it becomes necessary to remove the shaft, or its bushing, the oil cup is removed first; then the shaft is turned until the screw comes directly under the oil hole, where it is easily removed with a screwdriver.—Contributed by J. B. Murphy, Plainfield, New Jersey.

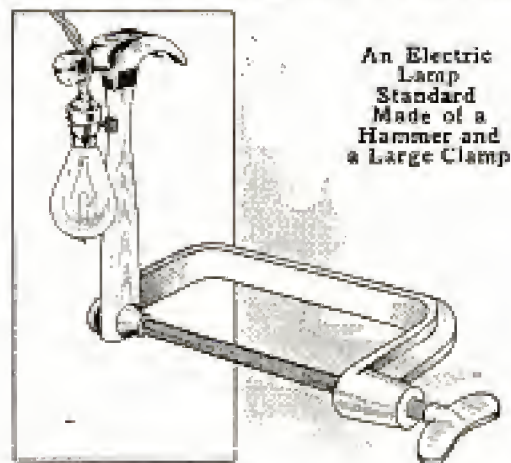
ⒸPulleys should be placed far enough apart on a shaft so that the belts will drop between them.

To Preserve Linoleum

When oilcloth or linoleum is first laid, apply a coating of varnish or shellac, and it will last much longer. In scrubbing the surface of these materials the color and design are worn away, as well as by the usual wear of walking on them, but the coat of varnish forms a protection and preserves the colors. It is only necessary to apply a coat of varnish from time to time to keep them in good condition.—Contributed by Leslie E. Turner, New York, N. Y.

Makeshift Lamp Standard

The ability to improvise necessary apparatus at a moment's notice is no small asset to the practical mechanic. I recently observed a mechanic working under difficulties, who was suddenly confronted by the necessity for an additional light. He immediately attached the extension cord to the head



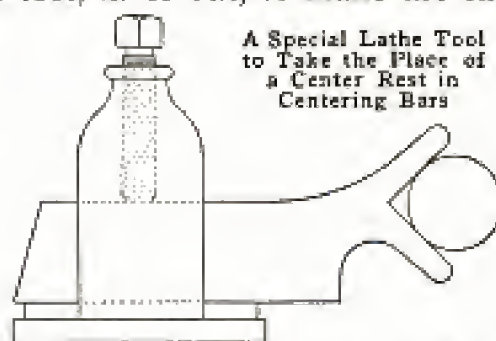
An Electric Lamp Standard Made of a Hammer and a Large Clamp

of a hammer, fastened the hammer in a large screw clamp, and supported the light as shown, all with complete satisfaction.—Contributed by John D. Adams, Phoenix, Ariz.

Centering Long Bars in a Lathe

The illustration shows a very simple form of tool for centering long bars in a lathe. The tool is set in the tool post of the lathe so that the bottom of the V-shaped part is on the same plane as the center of the lathe. In centering both ends of a bar, say, 2 ft. long, one end is gripped in the chuck while the

other is set in the V-shaped notch of the tool. When the lathe is started, it only requires a slight adjustment of the tool, in or out, to make the end of

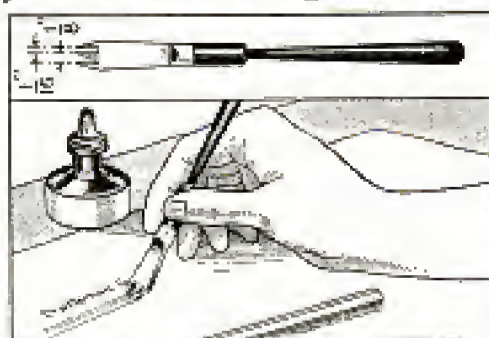


A Special Lathe Tool to Take the Place of a Center Rest in Centering Bars

the bar run perfectly true. The center drill is held in the tailstock and is fed toward the end of the work. If there is a number of bars of the same size to be centered, it is only necessary to leave the tool set, and the bars can be centered in a great deal less time than if a center rest were used.—Contributed by Charles Homewood, Waterloo, Iowa.

Marking Guide Lines for Letters on Drawings

A very simple and handy tool for the draftsman is shown in the sketch. Its use is for laying out guide lines for dimension figures, notes, etc., on drawings. The construction and use of this tool is self-evident. The pointed end is pressed on the paper and the imprint makes the guide points, correctly spaced for the three lines. In general practice these lines are drawn by guess, but it is just as easy to set them off right and have all

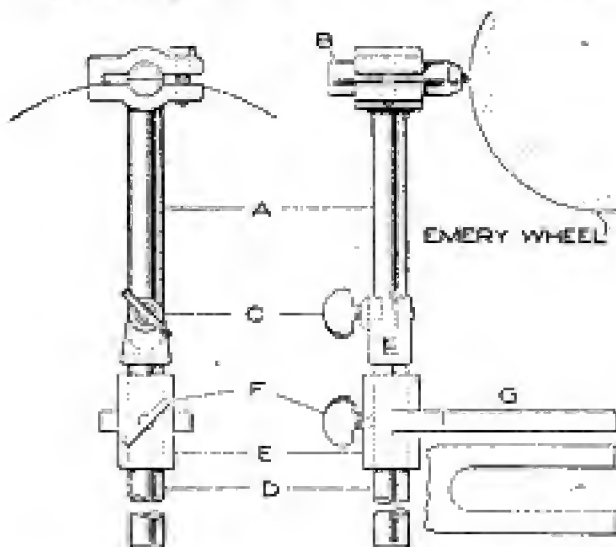


Marker for Laying Out Guide Lines to Make Letters and Dimension Figures Uniform on Drawings

letters uniform on all drawings. It is especially useful for making tables or notes where several lines are required.

A Universal Emery-Wheel Dresser

The tool shown in the illustration is designed for the shaping, dressing, and duplicating of forms in the various



Dresser Adaptable for the Tool Room in Shaping Emery Wheels to Special Forms

shapes and sizes on grinding wheels used in a tool room. A wheel having been formed to a special shape or angle, may be dressed as often as necessary, and the form accurately preserved.

The main arm A carries the black-diamond holder B at its upper extremity, the lower end being fitted into a hinge joint, C, on the vertical adjusting rod D. A wing screw is used on the hinge joint so that it can be clamped in any position desired. The bracket E holds the vertical rod D with the wing screw F, and has a clamping arm, G, for attaching it to any part of the table, or grinder head.

The wing screw F holds the diamond at the desired height; the arm A and the vertical adjusting rod D, of course, are free to turn in the main bracket E, and when turned to the desired position the screw is set to hold it. The diamond is then set, and the arm A moved in the direction of the curved line by hand, the rear of the diamond holder being used as a handle.

When the diamond has been passed back and forth across the face of the wheel a sufficient number of times, the

dresser is removed without changing the screw F, and if the position is marked on the dresser, it can be replaced and the wheel redressed any number of times without changing its form in the least.

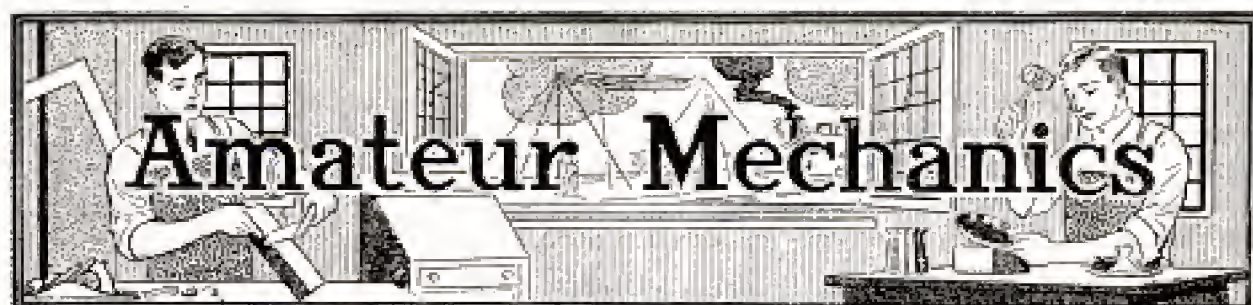
Driving a Motorcycle without a Carburetor

While out riding over a rough mountain road I took a tumble in a deep rut with my single-cylinder motorcycle. After righting myself and the machine, I discovered that the carburetor was a wreck, having come in contact with a rock in the roadway. To push a motorcycle is a hard and thankless job at the best, and on a very hot day it is doubly so, therefore I proceeded to get out of my predicament in the best way possible.

What was left of the carburetor was removed, also the hood covering the intake valve. Then I bent the gasoline-feed pipe until the end projected slightly over the end of the valve housing. Opening the needle valve in the tank, a small stream of gasoline was allowed to trickle over the intake valve, and when the motor was turned over, it started up quickly. By adjusting the needle valve in the fuel-supply line I managed to get a fairly good mixture. The engine ran about the same as if the carburetor had been intact and the throttle wide open. The 12-mile trip home was made without trouble, although I was forced to use the magnet cut-out occasionally to slow the machine down around corners.—Contributed by J. Walter Briggs, Stanfordville, N. Y.

An Alloy for Pattern Letters and Figures

A good alloy for casting pattern letters and figures, and similar small parts, in brass, iron, or plaster molds, is made of lead, 70 parts, and 15 parts each of antimony and bismuth. To make perfect work the molds should be quite hot.



New Method of Developing Roll Films

By T. B. LAMBERT

MANY devices have been made for developing and fixing roll films. There is the simple wholesale method of the professional who hangs a weight on one end of the film and lets it down in a deep tank of developing fluid where it hangs submerged from an upper support until the development is complete. Then the support, the film, and attached weight are removed, dipped into a similar tank of running water, then to another tank of fixing solution, and subsequently washed and dried.

This is the only practical plan where there are many such films to be handled simultaneously, but the amateur who has only one or two rolls a week cannot afford the tanks, the space, nor the expense incident to such a method. The film is usually drawn back and forth through a developing solution placed in a tray, and after the development has proceeded far enough, the same process used in washing, then the hypo solution, and finally through the last washing for about 20 minutes, all making a tedious process.

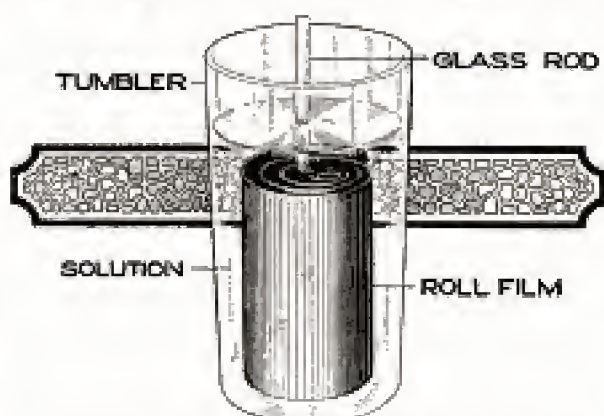
Some amateurs and a few professionals who but occasionally develop a roll film use a mechanical device that rolls the film into a light-proof package which is inserted in a metal tank for development and subsequent fixation.

This is a standard process, the apparatus being on sale at all supply houses, but it has its drawbacks.

The following method is not only simple but perfect in its operation and requires no special apparatus, only a tumbler or lemonade glass, and an ordinary lead pencil for its operation. A glass rod is preferable to the lead pencil, and it is also convenient to have a deep tin cup, or similar device, to cover up the lemonade glass and

make it light-proof, should it be desirable to turn on the white light in the dark room.

Pour enough developing solution into the glass tumbler to cover completely the roll of film when it is standing on end. In the dark room open the film roll, remove



An Ordinary Drinking Glass Used for Developing Roll Films

the backing paper and the paper ends on the film, run it through clear water until it is thoroughly and uniformly wetted from end to end, and drop it endwise into the tumbler of developer. Immediately insert the pencil or glass rod into the center of the roll, and with a rather quick circular motion, move the rod around so that it will quickly pass between the several convolutions of the film and thus distribute the developer all over its surface. Repeat this operation at once, then again in a few seconds, then in 15 or 20 seconds, then in 30 seconds, then

in 1 minute, and so on, with greater intervals of time. If a 20-minute developer is used, it will only be necessary, at the latter part of the development, to separate the layers every 2 or 3 minutes.

When the development is complete, pour off the solution and rinse in the same glass by letting water run through it while passing the pencil or glass rod between the layers several times. The water may then be drained off, and the glass filled with the fixing solution. While the film is fixing, the glass rod should be passed between the layers several times to renew the solution in contact with the film.

It will be seen that at no time after the first washing is it necessary to handle the film, so that damage to the film and staining the fingers are entirely eliminated. Further than that, no apparatus is tied up in the operation, and if a light-proof cup is at hand, the developing tumbler may be covered between the operations of separating the layers of film, and the white light of the dark room can be turned on for further operations.

Swinging Bags on the Arms of a Scarecrow

The ordinary ragman used as a scarecrow can be made more effective by adding to it something to make it move, or some part that flutters in the wind. This can be accomplished in one way by blowing up paper bags to expand them to their full extent, tying the openings as if they were filled with



Scarecrow with Swinging Paper Bags on the Arms in the Place of the Hands

some commodity for the household, and fastening them to the arms of the dummy as shown. These will swing and flutter about in a way that will materially aid in scaring away the birds that damage the crops.

An Artistic Card Tray

Serving and card trays can be made very beautiful and artistic with the use of butterflies, natural grasses, and the fluffy part taken from the milkweed pod, formed to make a natural scene beneath the glass bottom of the tray. If an old tray is to be used, remove the old panel, or painting, beneath the glass bottom, and clean the glass thoroughly. Lay it upside down on a flat table top and carefully place on it a cluster of grass, or weeds, or some botanical specimens, that are well dried. Arrange the dried butterflies in a natural way around the grasses with their backs, or tops of the wings, facing out, or on the glass.

The silky down of the milkweed seed, with the seed removed, is used to cover the specimens and grass, which forms the most delicate background possible. It is laid on quite thick at the bottom of the scene, gradually thinning it toward the top. Be careful to see that the fibers of the down are placed so that they will radiate from the bottom of the grasses to the outer edges. A piece of white, pearl, or gray cardboard is then placed on this background, and another glass or board back is sealed tightly over the whole with glue or wax.—Contributed by Joe V. Romig, Allentown, Pa.

Deodorizing Lard Buckets

Lard buckets are the most easily obtained and the most satisfactory of utensils in which to pack food, or cook for a small picnic or camping party, but it is very difficult to remove the odor of the lard. This may be easily accomplished by boiling the grounds from the coffeepot in the bucket with about one pint of water.

Paddling Your Own Canoe

by
Stillman Taylor

PART I— Kinds of Canoes



THE charm of the birchen canoe has long been sung in verse and prose, and while the bark that the Indian used has been supplanted by a more perfect type of modern manufacture, the popularity of this, the most graceful of water craft, has increased with years, until today we find the canoe the choice of thousands of recreation seekers who paddle about in park lakes and quiet streams, or spend their vacations in cruising down rivers and other attractive waterways—sometimes within the environs of towns and villages, and again dipping paddles in the wilderness streams of the far north. True, the modern canoe is a distinct product of the twentieth century, and while it is so largely used at summer resorts, it nevertheless retains all the good points of the old, while embodying numerous improvements which fit it even better for wilderness travel than the Indian model after which it was patterned. The noteworthy increase in the number of canoeists in the past dozen years is good evidence that this natty craft is fast coming into its own, and as more and more outdoor men and women understand its possibilities and limitations and become proficient in handling it, the long-rooted fear and distrust with which the uninformed public regard the canoe, will pass away. As a matter of fact, accidents ever follow

in the wake of ignorance and carelessness, and while there are very few expert gunners injured by firearms, and still fewer experienced canoeists drowned, there are numerous sad accidents constantly occurring to the reckless and foolhardy, who do not know how to handle a weapon, nor understand the first thing about paddling a canoe. Let us consider then, the practical side of the subject, the choice of a suitable canoe and the knack of handling it in a safe and efficient manner.

If one would experience in full measure the many-sided charm of paddling, he should get a good canoe. Unlike other and heavier water craft, the canoe is a lightly balanced and responsive conveyance, which may be cranky and dangerous, or safe and stable, according to the model, the skill of the builder, and the dexterity of the paddler. There are canoes and canoes, of varying models and sizes, and constructed of many materials, and while all may serve as a means of getting about in the water, the paddling qualities include numerous little idiosyncrasies which serve to differentiate canoes as well as men. In fact, this light and graceful craft may be properly viewed as the highest type of boat building, since it must be fashioned strong but light; it must be steady when going light; capable of carrying

comparatively heavy loads; draw little water, and it must be honestly constructed of good material to stand up under the hard usage which every canoe is subjected to, whether used for summer paddling, or upon long hunting and shooting trips.

Three types of canoes are in common use by experienced canoeists, the birch-bark, the all-wood, and the canvas-covered cedar canoe. The birch-bark, by reason of its rougher workmanship, is slow under the paddle, is easily injured, and it grows heavier and more difficult to handle every time it is used. The all-wood canoe is most expensive to buy, and though swift under the paddle, is too easily injured and too difficult to repair for rough and ready use. The cedar-planked canoe which is covered with filled and painted canvas is for many reasons the best all-around craft—attractive enough for park use, and stout enough for use in rapid water and for cruising in northern lakes and rivers.

How to Select a Birch-Bark Canoe

The Indian-made birch-bark canoe costs about \$1 a foot and is fashioned of birch bark over an ash, or spruce, frame. The bark is not nailed to the frame, but is sewed together with boiled spruce, or tamarack, roots, split to a suitable size. To give the proper shape to the canoe a double row of stakes are firmly planted in the ground and the spruce frame is sprung between them. The bark is put on inside out, and the work of sewing together is done while the bark is fresh, or immediately after it is stripped from the tree. The seams are afterward made water-tight by smearing well with spruce gum, which hardens quickly and makes a fairly good joint. The Indian model is a good one so far as the freeboard, width of beam, and flaring stems are concerned, but the curved bottom makes it extremely cranky and dangerous for the novice to handle. Be sure to see that the birch-bark canoe is fashioned with a flat, straight bottom, which makes the craft steadier and less inclined to veer about under

the stroke of the paddle. In an expert's hands the round bottom will be found a decided advantage, making it faster to paddle and more easily turned and steered in swift and rough water. Many prefer the three-piece bottom, but the bottom made of a single piece of bark is stronger and less likely to open up and leak. All birch canoes will warp and twist somewhat, and it is practically impossible to find one that is straight and true. The birch-bark canoe has many limitations and not a few weaknesses, but if one has the good luck to find a good one, and treats it fairly, it will prove a safe and dry craft for many hundreds of miles' travel. Of course, one must carry a kettle of pitch for making repairs, and be content to travel somewhat slower than with modern canoes, but this may not be a disadvantage. Birch canoes have no seats, as the Indian kneels when paddling, but a low thwart, or seat, is easy to put in at the bow and stern, if one prefers the white man's paddling position.

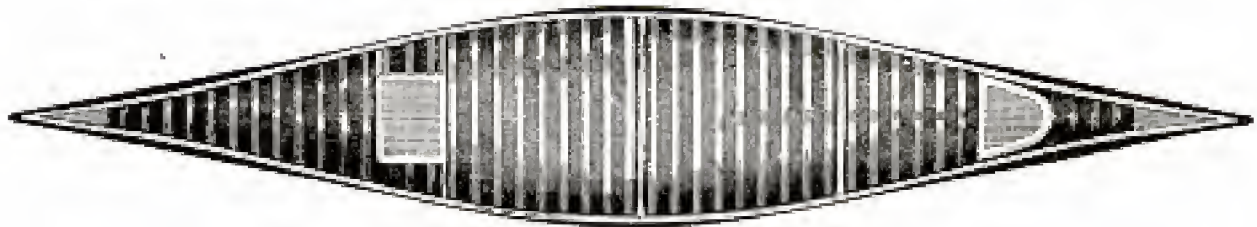
All-Wood or Peterborough Canoe

This type of craft is much used in Canada along the St. Lawrence River, and to a much less extent by American sportsmen, owing to its higher cost, and its tendency to break and cause a leak. Of course, the all-wood canoe is a good craft, but everything considered, there can be no question in the minds of canoeists who are acquainted with all types of canoes, that the all-cedar or basswood craft is less dependable than the canvas-covered cedar canoe. The Peterborough type—so called from a Canadian city of this name where many wood canoes are made—with its relatively low ends and straight sides with but little sheer and tumble home, is the model commonly used by practically all manufacturers of the all-wood canoe. While a boat of this kind can be, and often is, used in rough-water lake paddling as well as in wilderness travel, the all-wood canoe is better suited for club use, and in the wider and more quiet-flowing streams and lakes.

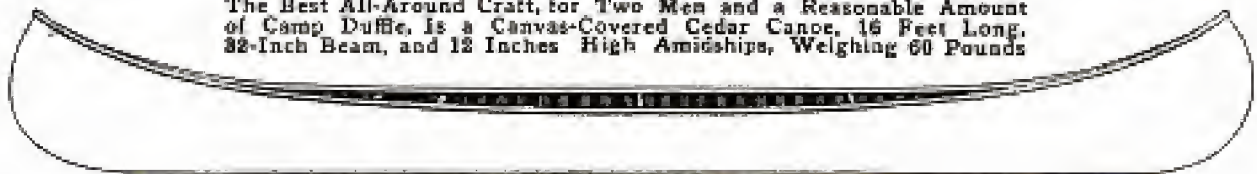
The Canvas-Covered Cedar Canoe

The canvas-covered cedar canoe, when rightly made of the best material, is by all odds the best paddling craft afloat, being strong and light,

price to obtain a good craft, and while various manufacturers supply canoes of similar types at different prices, some of them are so inferior that they will scarcely stand a season's use. Of



The Best All-Around Craft, for Two Men and a Reasonable Amount of Camp Duffle, is a Canvas-Covered Cedar Canoe, 16 Feet Long, 32-Inch Beam, and 12 Inches High Amidships, Weighing 60 Pounds



with a hull so smooth that it is swift to paddle, while the mode of construction makes a very stiff craft, which will not warp or twist out of shape. Moreover, it will stand a vast amount of hard usage and abuse, while repairs are quickly and neatly done by the stream side. In the making of a first-class canoe of this type, the ribs are first steamed and then bent and fitted over a solid form; cedar being used for the ribs and planking; spruce for the gunwales, and white ash, or oak, for the stems and thwarts. In a canoe built according to my instructions, each plank runs to the full length of the craft and all are beveled and lapped together, thus making a perfectly smooth and almost water-tight canoe, before the canvas is cemented on its surface. The canvas is thoroughly waterproofed before it is put on, then it is drawn tightly over the planking, and several coats of filler and the final finish of paint are applied, after which it is rubbed down.

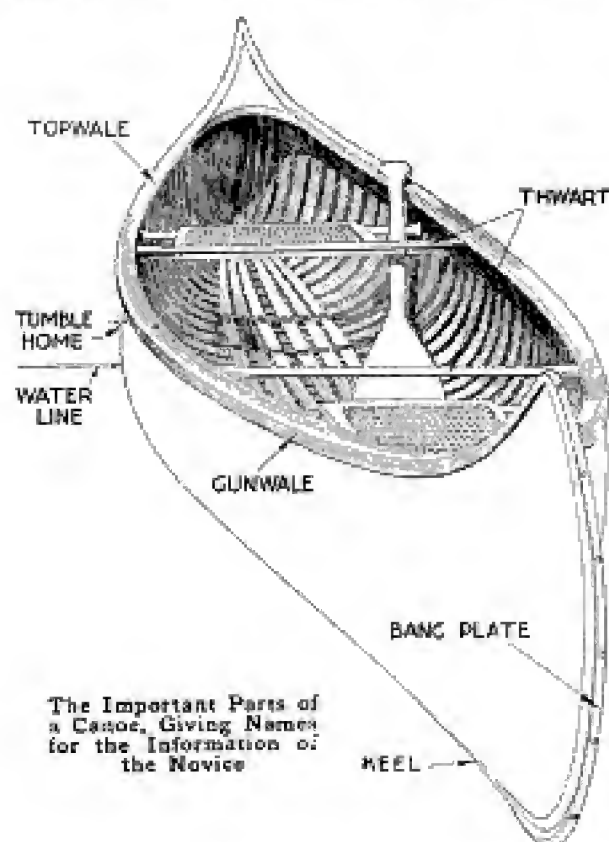
The well-made canvas-covered canoe is, if properly designed, a pretty good facsimile of the representative Indian model in that it possesses all the good points of the birch-bark canoe, but is more substantially constructed, of better and more durable material, and more finely finished. In making the selection, it is necessary to pay a fair

course, the use to which a canoe is put will influence the selection. If the craft is wanted for long service on hunting and fishing trips, a high-grade canoe of plain finish is the logical choice. If the canoe is for club use, a highly finished craft with mahogany trimmings may be preferred. A canoe for occasional use on some quiet lake or small stream may be selected from the cheaper kinds, which will, no doubt, answer every purpose. However, most manufacturers list what they call an "A" and a "B" grade. The "A" grade provides selected-cedar ribs and planking; oak for gunwales, stems, thwarts and seats selected from the finest material, and the finish the best that can be procured, while the "B" grade is identical in model, canvas and paint, but the material not quite so clear or free from minor defects, though for all practical purposes it will render as much service and give fully as much satisfaction as the first, or "A," grade. A little saving may be made by selecting the second-grade canoe, having most of the money invested in the canoe and not so much in the finer finishings. The ordinary construction provides for the ordinary solid topwale, but the open gunwale is sometimes preferred, because the openings make washing easy, all sand and dirt running out freely between the wales. This

construction detail is supplied by most manufacturers, when specified, at a slight additional cost.

Points to be Considered

The particular shape, combined with the dimensions, of the canoe is commonly called the model, and since



many canoe builders offer several different models it is a comparatively easy matter to find a craft which fully meets one's ideas of a canoe. Canoes can be had as small as 10 ft. long and weighing as little as 18 lb., while others are built all the way up to 35 ft. and ranging around 50 in. wide. For all-around use, that is for cruising, hunting, and fishing, the 16-ft. length, with 32-in. beam, 12 in. deep amidships, and weighing about 60 lb., will meet the approval of the experienced canoeist. In a good canoe of this size a flat floor, medium-high ends, and a fair amount of tumble home—to add stability and keep the water from shooting inboard—may be reckoned the "earmarks" of a general-purpose craft. For exclusive river work, where many rapids are en-

countered, a lightly rounded bottom, a trifle lower in the center than at the ends, will be easier to handle in white water, while comparatively narrow ends will give more speed under the paddle.

All canvas-covered canoes are provided with brass bang plates, or irons, at stern and bow, and if wanted, an outside keel may be furnished. In most cases this is not essential, but when the canoe is largely used in rocky rivers a broad keel of $\frac{1}{2}$ -in. oak, or ash, 2 $\frac{1}{2}$ in. wide in the center and tapered at both ends to fit the brass bang irons, will protect the bottom from hard knocks. The narrow 1-in. keel is an out-and-out nuisance, making the canoe slow to turn and furnishing but scant protection for the bottom. Any keel adds to the weight of the craft, and weight is a factor that must be considered when much portaging is done. So far as capacity is concerned, a canoe, 16 ft. long, 32-in. beam, and 12-in. amidship depth, will accommodate two men and the usual amount of camp duffle, weighing from 350 to 400 lb. On short trips, a 15-ft. canoe may be made to accommodate two men, while on very long cruises, where a larger amount of duffle must be taken along, an 18-ft. canoe may be needed. For three persons, the 17 or 18-ft. canoe, of 34-in. beam, is about right, but for a party of four it is better to use two 16-ft. canoes than one large craft. In fact, canoes longer than 18 ft. are more properly regarded as freight craft and only used on special trips.

Moccasins, or rubber-soled footwear, are most suitable for the canoeist's wear, but since heavy-heeled shoes are often worn, it is a good plan to protect the thin planking by running a slatted floor, 8 or 10 in. wide, in the center of the canoe. Provide this grating with brass buttons, and it will be held firmly in place, but removable at any time. For convenience in towing, a small but flexible rope—braided cotton is always soft and pliable—about 20 ft. long, should be tied at both bow and stern. The ordinary "painter eye," which fastens with a bolt screwed to the un-

der side of the breast hooks, is good, but a small hole, through which the rope is securely knotted, will serve as well.

Paddles

The best material for paddles is good selected spruce, and while this material is not so heavy nor will stand hard knocks so well as maple or birch, its lightness makes it the choice of many paddlers. For rough work the maple paddle may be chosen, and while heavier than spruce, it possesses greater elasticity, and this spring offsets to a great extent the larger weight of material. Cedar, ash, and pine make excellent paddles, and the Indians often fashion them from these woods.

In selecting a single-blade paddle, it is well to remember that the length will depend on the paddler's height, for it is self-evident that a tall man will require a longer paddle than a short person can conveniently swing. Hence the usual rule is to pick out a paddle as long as the paddler is tall, and is a sensible one to follow, although there are exceptions. Personal preferences differ, and, also, a longer paddle will be required when paddling from seats than when a kneeling position is adopted. For general use, the stern paddle of 5½-ft. length will be long enough, while the bow paddle of 5 ft. will probably suit the average man. Ladies, boys, and girls will need shorter lengths.

The shape of the paddle blades varies somewhat, and while some prefer a broad blade and others a narrow one, it is well to pick out one of medium size. Large blades are tiresome for long trips, while the narrow blade balances best in the hand, but affords less resistance in the water. When picking out a spruce paddle, see that there is plenty of wood at the juncture of the blade and shaft, for it is at this point most paddles break. Spruce being a comparatively soft wood, it will fur badly, and the blades should be fitted with copper tips to prevent splitting. Maple paddles do not need this protection, but most builders err in making them too thick and heavy.

Pick out the lightest and thinnest maple paddle that can be found, one that is fashioned of straight-grained wood, and test it for elasticity before making the purchase. A couple of



Canoe Yoke Equipped with Adjustable Shoulder Pads, and the Pneumatic Carrier That Serves Two Purposes

coats of spar varnish will keep the paddles in good shape, but as a varnished surface is hard on the hands, most veteran canoeists varnish the blades and finish the shafts with oil. An extra paddle will, of course, be carried on all long trips.

The single-blade paddle is quite universally used, but the double-blade gives more spread for the lone paddler. Although the double-blade was designed for the "Rob Roy" type of canoe—a one-man craft, decked both fore and aft, the paddler sitting in a cockpit in the center—it is sometimes used for propelling the open Canadian canoe, and when the canoeist travels alone, the double-blade is a good choice, especially on open waters where much wind and high seas are likely to be encountered. Spruce is the best material for double paddles, and 10 ft. is the best length. As all double-bladed paddles are provided with a ferrule, or friction joint, in the center, they may be unjointed and each used as a pair of single paddles. In case the open end of the metal ferrule is objectionable, a wood plug may be fitted to provide a palm grip, similar to the grip of the single paddle.

Portages for Carrying the Canoe

When the weight of the canoe does not exceed 65 lb., it is easily carried by placing the paddle blades over the center thwart, the ends under the next after thwart and lashing them securely in place; then placing a sweater or coat over the shoulder to form a

pad on which to rest the paddles to carry the canoe in an inverted position. However, when long portages must be undertaken the "neck yoke," or the pneumatic canoe yoke, may be used. The neck yoke is fashioned from a block of pine, or other soft wood, to fit the curve of the shoulders, and the ends fit in the grooves made in the gunwales; or small pieces of wood may be screwed to the under side of the gunwale to serve the same purpose. The pneumatic cushion, which fits around the neck and is provided with straps to

secure the paddles in position, is well liked by some canoeists, but the wood neck yoke fits so well that it is hard to find a good substitute. A large and heavy craft can be easily carried by two men by turning the craft bottom side up and resting the weight on the back and shoulders. If the man at the stern lets the gunwale rest on his shoulders and his companion lowers the front thwart to rest against his neck and shoulders, both may carry a light pack of duffle and will have a clear view of the trail ahead.

To Practice Batting for Baseball Playing

A boy with a very great desire to make a good ball player found that he could not hit a ball tossed to him.



Learning to Strike a Ball without the Aid of a Pitcher or Fielder

Try as he might, the bat never hit the ball. Some one suggested that a ball hung by a cord would help to a great extent, and it was tried out with excellent results. An inexpensive ball was suspended from the limb of a tree so that it would be at the proper height for the batter. In striking at the ball it was not necessary to make home-run hits, as this is liable to break the cord, or get it tangled to its support. If

the strikes are made properly, the ball will swing out and come back in a perfect curve, or can be made to come back bounding and in no straight line. This will teach the eye to locate the ball and make hits where it cannot be taught by having some one toss the ball to the striker.

Making Impressions of Leaves

A very true and artistic impression of a leaf, or similar object, can be made as follows: Grease a piece of heavy writing paper with linseed oil, and smoke the surface well by lighting a small piece of camphor gum and holding the paper over the flame. Place the leaf on the smoked surface of the paper and cover it with several thicknesses of newspaper, then press the leaf into the blackened surface. Remove the leaf and lay it with the blackened surface on a piece of white paper, then cover again with the newspaper and press evenly and thoroughly. A beautiful and permanent impression of the leaf will be transferred to the paper.

Care should be taken not to move the leaf the least bit either in coating it with the smoke or in transferring it to the paper. Be careful not to use too much oil. This process can be used to stamp cloth for embroidery. A candle can be used in place of the camphor if care is exercised, but the camphor gives a very dense smoke with a minimum of heat.—Contributed by J. H. Beebe, Rochester, N. Y.

Homemade Instantaneous Camera Shutter

Exposing with the ordinary shutter allows the light to strike equally all over the sensitive plate or film, and in a well-timed foreground the picture will

show in which the shutter blades are attached.

The shutter blades can be made of hard rubber or fiber, but those shown were constructed as follows: A piece of veneer, 12 in. long and 4 in. wide, was cut into three equal parts, each

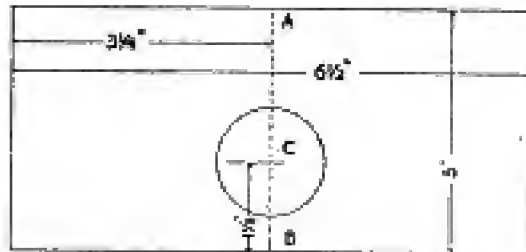


FIG. 1

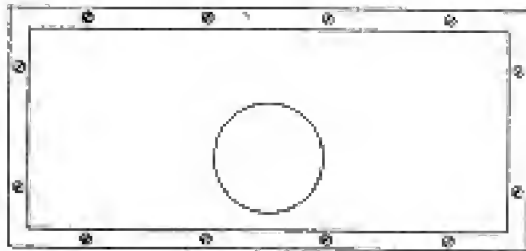


FIG. 2

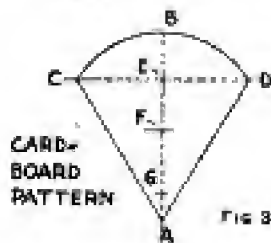


FIG. 3

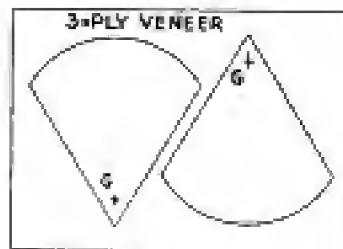


FIG. 4

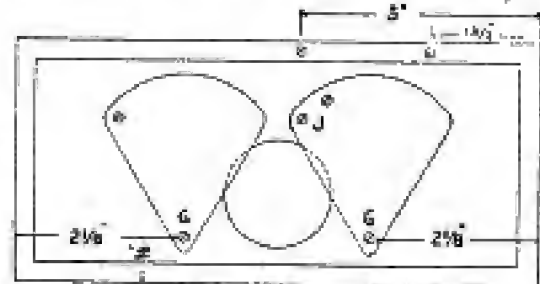


FIG. 5

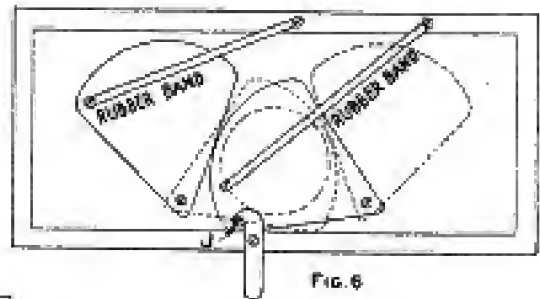


FIG. 6

Details of the Parts for the Construction of a Camera Shutter That will Give Twice as Much Time on the Foreground as It will for the Sky, Which will Even Up the Exposure to Some Extent

present a "bald" sky without any gradation whatever, but with the shutter illustrated, the lower or foreground part of the lens is unobstructed almost twice as long as the other half, thus allowing more time where it is needed. The material for the making of this shutter is a few thin pieces of wood that can be taken from a discarded cigar box, some walnut or mahogany veneer, a few screws, and a piece of sheet brass.

The dimensions given are for a shutter to fit on the outer end of a lens barrel measuring $1\frac{3}{8}$ in. in diameter, but slight changes can be made for other sizes. The location of the hole is important, and it should be cut out to fit the lens barrel snugly. On the face of the board, around the edge, a $\frac{1}{4}$ -in. strip is glued and further fastened with flat-headed screws. This forms a re-

measuring 4 in. square. These pieces were glued together with the grain of the center one running at right angles to the grain of the other two, and clamped with hand screws until the glue hardened. This formed a piece of three-ply veneer that would not warp or split. A pattern is then laid out on a piece of thin cardboard, as follows:

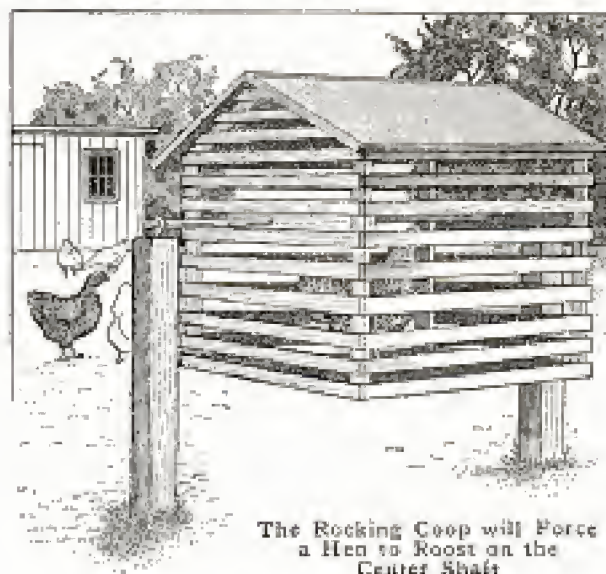
Draw two lines, AB and CD, Fig. 3, on the cardboard at right angles, and from their intersection, at E, lay off a distance of $1\frac{3}{4}$ in. to A and from A measure back $1\frac{1}{8}$ in. to F; with F as the center draw the arc CBD, using a compass set at a radius of $1\frac{1}{4}$ in. Draw the lines CA and DA. Lay off a distance of $\frac{5}{16}$ in. from point A to G, and punch a small hole through the cardboard, at G, with a pin or needle. The outline of this pattern is then cut out

with a knife or scissors. Use the pattern for laying out two pieces to be cut from the three-ply veneer. While marking the outline on the wood, mark a point through the hole at G. Saw out the wings and smooth up the edges with sandpaper, rounding the sharp angles slightly. Drill holes through the wings at G, to make a working fit on screws. The wings are fastened in the board at the locations shown.

A small release is made of the piece of sheet brass, to correspond to the shape and dimensions shown at H. This release is mounted on the lower edge of the board, in the center, as shown. It engages the screw J on one shutter, and two rubber bands are used, as shown, to draw the wings over in front of the lens. The time of the shutter can be regulated to some extent by the use of different sizes of rubber bands.—Contributed by L. G. Burnand, Lyons, Iowa.

To Discourage a Hen from Sitting

The device consists of a coop made of lath about 2 ft. square and swung on a shaft set a little above the center



The Rocking Coop will Force a Hen to Roost on the Center Shaft

so that most of the weight will be below the shaft on the lower part of the coop. The ends of the shaft are set on posts about 3 ft. above the ground. It is impossible for a hen to sit on the slatted bottom, and if an attempt is made, the rocking and tip-

ping of the coop will soon make her seek a more stable support, and the only one within the coop is the shaft passing through it; and the most persistent broody hen is usually glad to roost on it the first night. When the hen has perched for two nights she may be considered cured. This coop will accommodate three or four hens without crowding and insures quick results.—Contributed by Benjamin R. Bush, Bay Shore, N. J.

To Produce Smoke with an Empty Pipe

Two clay pipes are shown empty, then the bowls are placed together and the performer puffing on one of the pipes produces clouds of smoke. To perform this trick, dip a small piece of cotton in muriatic acid and smear it over the inside of one of the pipes; the other pipe is treated in the same manner, using liquid ammonia on the cloth. They are then ready for use as mentioned.

Smoke may be blown into a covered glass by rinsing the inside with the acid and smearing the bottom of a saucer with the ammonia, then placing the saucer on top of the glass and covering both with a handkerchief. Stand about 3 ft. from the table and blow the smoke from a cigar, or cigarette at the handkerchief, stating that the glass will thus be filled with the smoke. The handkerchief is then taken off, and on lifting the saucer a cloud of smoke will arise.—Contributed by Geo. W. Catlin, Winnipeg, Man.

Substitute for a Knife to Cut Fruit

While out on a fishing expedition one of the lunch baskets was found to contain a large piece of watermelon, but, there was no knife to cut it. A piece of strong thread solved the problem, however, and the melon was cut as well as if a knife had been used. Thread will cut almost any fruit, and many times it can be used when there is no knife at hand.—Contributed by J. Weiss, New York, N. Y.

Inlay Work on Wood

By J. A. SHELLY

ONE of the easiest made and at the same time most artistic forms of inlaid ornamentation is the stripe-and-crossband variety, which shows two narrow stripes with the space between them filled with a wood having its grain running at right angles to the stripes.

The panel shown in the illustration can be made of black walnut; the thin strips, $\frac{1}{16}$ in. thick, of white holly, and the center cross-grain band, or filler, of mahogany, $\frac{3}{8}$ in. wide. Other combinations of color will suggest themselves to the individual designer, but the wood selected for the stripe must be of a color that will show a decided line against the background, while the crossband should be several shades darker or lighter than the background.

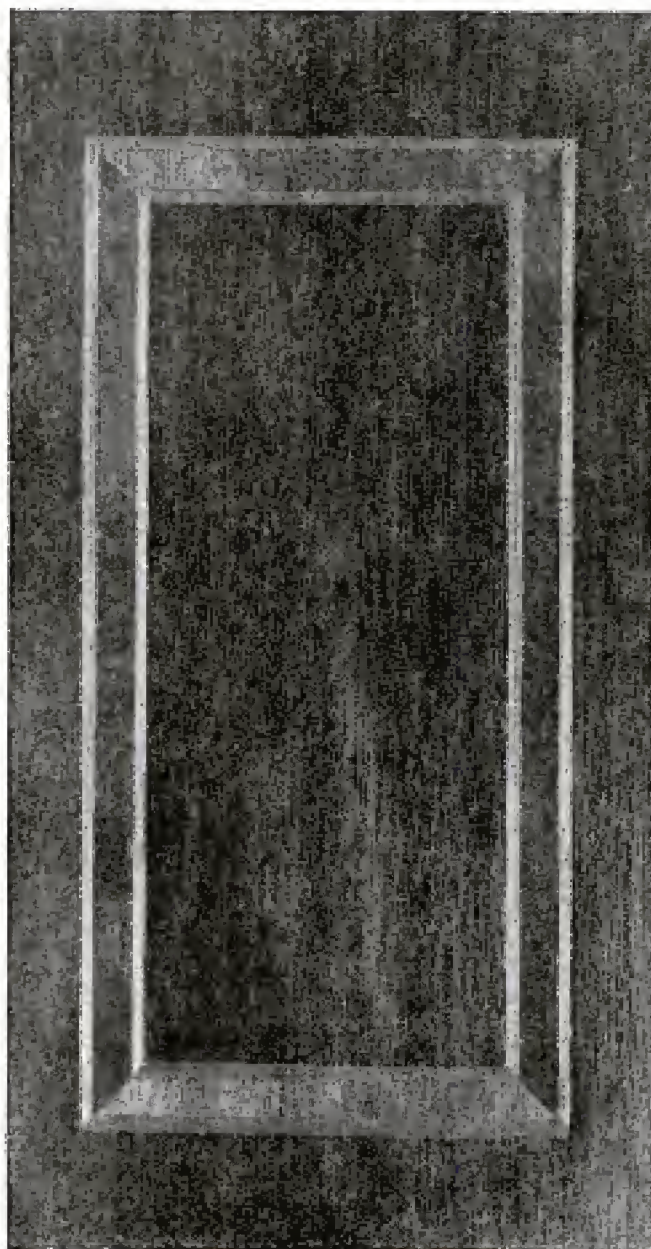
The thin stock for making the stripes is best procured from some dealer in scroll-saw supplies, as it is very reasonable in price and comes in almost any thickness, from $\frac{1}{32}$ in. up.

The stock for the crossband may be of any thickness, but it will be found more convenient if cut from a board

not less than $\frac{7}{8}$ in. thick. With a good, sharp plane, square the end of the piece of the stock with one face and edge, then gauge a line on each face, the width selected, or decided upon, for the crossband.

Cut to this line, leaving a little for planing, so as to get the short-grained piece perfectly parallel. Cut from some thin stock, two pieces of the same length as the short-grained piece and of a width equal to the thickness of the board from which it was cut.

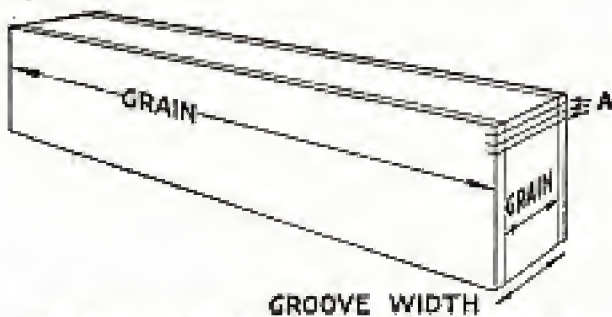
These three pieces are to be glued together, as shown in the illustration, and to secure good, close joints, they must be clamped between two good, straight pieces of 1-in. stock until the glue dries. The crossband piece is first sized, which is done by coating the end grain of the wood on both sides with thin glue, and rubbing it in with



Walnut Panel Representing a Cabinet Door Inlaid with White-Holly Strips between Which is Placed a Light Mahogany with the Grain Running Crosswise

the tips of the fingers, to fill the pores of the wood. One of the thin pieces is then coated on one side with fairly thick glue and laid on one side of one of the 1-in. pieces. The crossband is then coated with glue on one side and

laid on this; glue is then applied to the other side, and the second thin piece glued and set on top of it. This is followed by the second 1-in. piece, and the



The Short Cross-Grain Piece Glued between Two Thin Pieces of Light-Colored Wood

whole is clamped together with two or three hand screws.

Some care must be exercised to avoid getting glue on the 1-in. pieces, and it is a good rule to follow, when gluing two or three pieces together, always to adjust the hand screws before applying the glue.

After the glue has thoroughly dried and the clamps and clamping pieces are removed, face both edges of the block with a sharp plane, squaring from one of the thin-strip sides. The marking gauge is next set to $\frac{1}{16}$ in., and lines, A, are gauged from each square face. The block is sawn to these lines on a band, jig or scroll saw. The sawing should be carefully done, so as to just split the gauge lines, as it is very difficult to plane these thin pieces without breaking them.

After the two first cuts are made, the edges of the block are again faced and gauged, and these operations repeated until the block is all in strips.

To accomplish the real work of inlaying the thin strips or veneers, a square, marking gauge, sharp knife, and router are required. The gauge spur should be filed flat on each side, so as to present a nice sharp edge that will cut deeply.

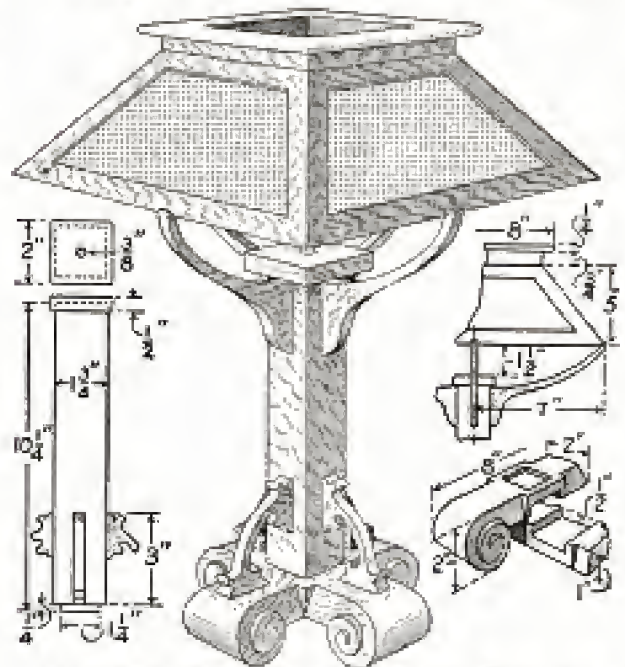
In gauging the parallel lines for the strip recesses, make the gauge lines just meet at the corners, and adjust the gauge so that the distance between the lines is just a trifle less than the width of the strips. The lines that cross the grain should be first gauged, and then

cut deeply with a knife point, using the square to get them nice and true.

After the lines are laid out, the stock between them is removed with the router to a depth of $\frac{1}{16}$ in. The strips should be tapered slightly on the edges, with a file or scraper, so that they will enter the recesses easily and still show a nice close joint on the face. Each piece will of course have to be fitted, mitered, and glued in place separately.

Table-Lamp Stand and Shade

The illustration shows a table lamp suitable for either gas or electric lighting. The base consists of two pieces, 2 in. square by 8 in. long, and halved, as shown. The curved ends may be cut with a scroll saw and chiseled out, the deepest cut, $\frac{1}{4}$ in., being at the top and tapering off to full width at the bottom. In the center of the upper, overlapped piece, a mortise should be cut, $\frac{1}{4}$ in. deep by $1\frac{1}{4}$ in. square. The post can be made from stock, $1\frac{3}{4}$ in. square by $10\frac{1}{4}$ in. long. On one end should



Lamp with a Fancy Base, Suitable for Either Gas or Electric Light

be cut a tenon, $\frac{1}{4}$ in. long by $1\frac{1}{4}$ in. square, to fit the mortise in the base. At its upper end is fastened a 2-in. square by $\frac{1}{2}$ -in. thick cap, which is recessed to fit the post. All parts should

be carefully sandpapered and then glued together. In order to provide a passage for the pipe, if gas is to be used, or for the wire, in using electric light, a $\frac{3}{8}$ -in. hole should be drilled centrally through the post and base. If a bit long enough to pass all the way through is not handy, the remainder of the hole can be burned out by using a red-hot rod.

The shade consists of four frames, all alike, mitered at the edges and glued together. The joints of the frame are end-lapped, and do not show when assembled. In order to hold the glass, each piece of the frame should be rabbeted, before assembling, sufficiently deep so the glass may be held in place with triangular cleats. After assembling and gluing the sides of the shade, the top may be finished off with suitable molding, mitered at the corners, or, if none is handy, square pieces surmounted by beading strips may be used, which will give a finished appearance to the shade. In ordering the glass, it is best first to make a template of pasteboard and see that it fits well, then have the glass cut to the template.

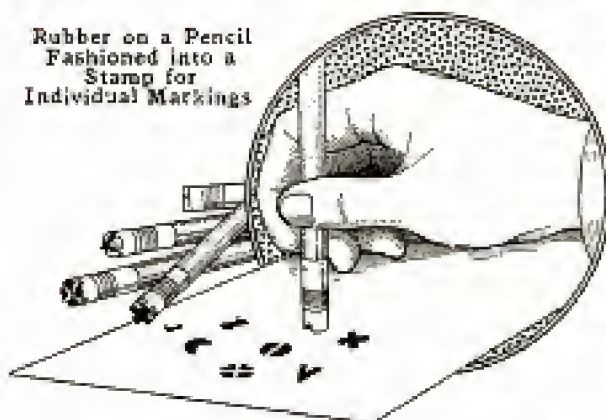
The brackets for supporting the shade, and the lower set for bracing the post, will show up best if made of bronze, cast from a suitably designed pattern and finished by filing, buffing, and lacquering. They can be fastened in place with countersunk screws to match the brackets.

A good finish for the stand can be obtained if it is coated with a mahogany stain, carefully applied, and varnished when dry.—Contributed by J. E. McCloskey, Erie, Pa.

Individual Stamp on a Pencil Rubber

Frequently it is necessary for a clerk to place his individual mark on a package, or opposite some book entry, but as it is bunglesome to carry a rubber stamp in the pocket, one may be fashioned on the rubber tip of a lead pencil, which can then be used at both ends. A sharp knife will easily cut individual marks of various types, as shown. Marks of this character are al-

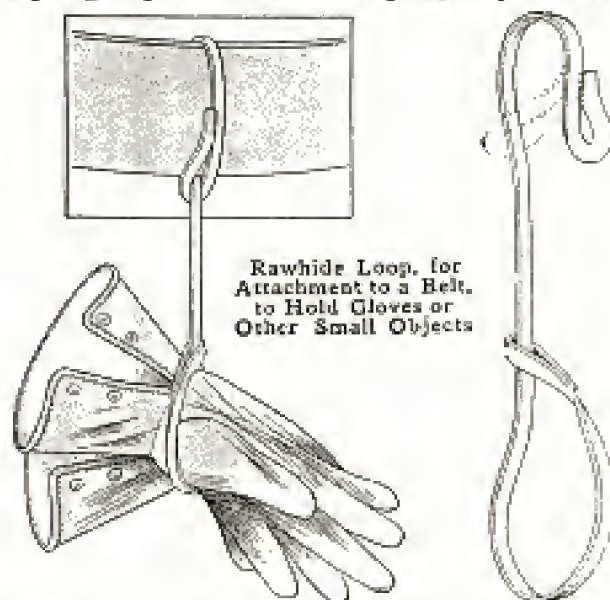
ways uniform, something that cannot always be achieved by a lead-pencil



mark. Of course, the rubber must not be used as an eraser.

Belt Hanger for Carrying Gloves

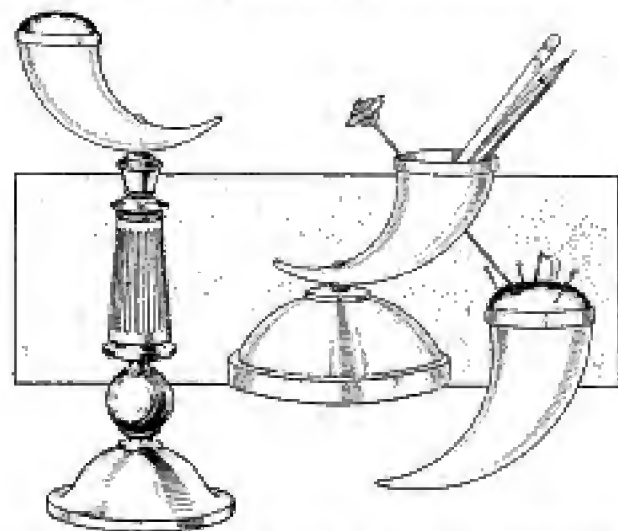
A practical device, for the use of horsemen, hunters, and sportsmen generally, in which to carry a pair of gloves, a muffler, or the like, can be made from a piece of rawhide, about 12 in. long, $\frac{1}{8}$ in. wide, and a little less in thickness. An eye of such size as will permit the forming of a hard-running loop is provided at one end, and a loose-running loop is made at the other. The latter is slid over the belt, and the object to be carried is inserted in the larger loop, which is then drawn up tightly around it. If properly made,



the loop will securely carry any light article of soft material that can be squeezed tightly by it.

Ornamental Pencil and Pincushion Holder

A nicely polished animal horn may be turned into an article of utility instead of being merely used as a wall



Fastening a Horn to a Base to Make an Ornamental Pen or Pincushion Holder

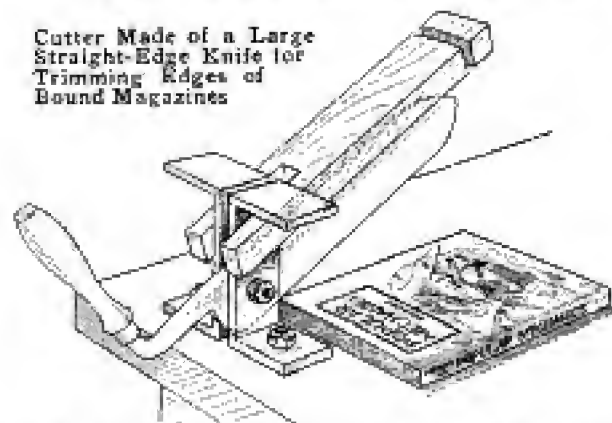
ornament, as shown in the illustration. An old lamp base, heavy enough to balance the horn, and secured to it with a bolt, is all that is needed to effect the transformation.

Knife to Trim Magazines for Binding

There has been a number of descriptions telling how to bind magazines, but none how to trim the edges after having bound them. Desiring to have my home-bound volumes appear as well as the other books, I made a trimmer as follows:

Any large knife with a straight edge

Cutter Made of a Large Straight-Edge Knife for Trimming Edges of Bound Magazines



will do for the cutter. I used a large hay knife. A $\frac{3}{8}$ -in. hole was drilled in

the untempered portion near the back of the handle end. Two U-shaped supports were made of metal and fastened to the top of an old table, between which the knife was fastened with a bolt. A piece of timber, 6 ft. long, 4 in. wide, and 2 in. thick, was used as a lever. One end of this piece had a U-shaped notch cut in it to straddle the supports under the projecting ends. A board was attached to the table top, having one straight edge set where the knife edge would just pass it.

If the knife has a good sharp edge it will do very satisfactory work. When the edges are trimmed the knife can be removed and used for its original work.—Contributed by E. S. Mundell, Lowpoint, Ill.

How to Repair Rubber Gloves

While making a bunglesome job of patching a pair of rubber gloves, which I used to keep the stains from my fingers while developing photographic plates, a physician friend happened along and told me how to do it properly. The method is as follows: Procure a piece of card, such as heavy Bristol board used for filing cards; spread it on one side, rather thick, with ordinary library paste and stick it to the rubber tissue, preferably dentists' rubber dam of light weight; smooth it flat, and let the paste dry. When a patch is needed cut one out, rubber and card together, and fit it to the cut in the glove. Put the glove on the hand inside out, moisten the patch with cement, let it dry for a few seconds and then press it in place hard. If the tear is large, it is easier to lay the moistened patch down and fit the edges of the tear to it, then press hard in place. After the cement has thoroughly dried out, soak the patch in water and remove the bit of card. This gives a patch fastened securely to the extreme edges; flat, water-tight, and as fit to stand boiling as any patch, for sterilizing. After removing the card, the glove is dusted with talcum.—Contributed by J. S. Hogans, Uniontown, Pa.

A Tuberculosis Cottage

By N. F. FULTZ

The tuberculosis society of a certain locality needed a demonstration cottage for their crusade against the white plague, and they placed their need before the boys of the public-school shops. One class of eighth-grade boys volunteered, and two days after the job was started the complete cottage was delivered to the society. The material required for its construction was as follows:

220 linear feet of ship-lap, 1 in. thick and 6 in. wide.
80 ft. of 1-in. flooring.
6 studs, 14 ft. long.
7 pieces for plates and rafters, 2 by 4 in., 10 ft. long.
3 pieces for sills, 2 by 4 in., 10 ft. long.
100 ft. of sheathing boards.
100 ft. of tar roofing paper.

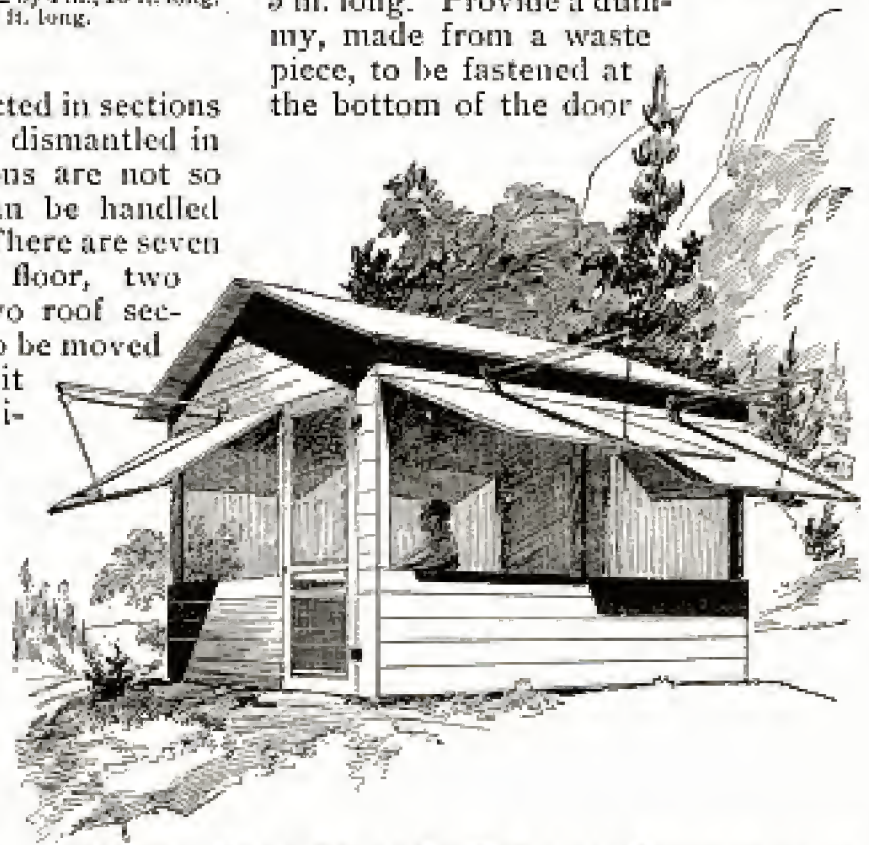
The cottage is constructed in sections and can be assembled or dismantled in 30 minutes. The sections are not so heavy but that they can be handled with ease by two men. There are seven sections, namely, the floor, two sides, two ends, and two roof sections. If the cottage is to be moved only a short distance, it can be loaded into an ordinary dray assembled.

Since the building is made in sections, it is well to construct the floor first, which is a simple matter. Cut two sills of the 2 by 4-in. stock, 10 ft. long. Cap these onto the ends of the five joists, which are cut from 2 by 4-in. stock, to a length that will total 8 ft. when the thickness of the two sills are added. Lay the flooring the long way of the section, bringing it flush with all outside edges. This completes the floor section.

The two side sections are made in a similar manner. Cut the studs—12 of them—6 ft. 4 in. long, and four plates, 10 ft. long. Cap the ends of the studs with the floor and rafter plates, according to the measurement on the floor plan. Nail five pieces of ship-lap, cut 10 ft. 11½ in. long, on the bottom of the

section, and one similar board to the top edge. Bore four holes, ⅝ in. in diameter, 1 in. from the outside edge in the floor plate. These are for ½-in. lag screws, to hold the parts together when the sections are assembled.

The front-end section is arranged for a 30-in. door. The top, or rafter, plate is cut 7 ft. 4½ in. long. This makes the allowance for the width of the side studs and plates when they are to be assembled, a very important matter to remember. The floor plate is cut 4 ft. 5 in. long. Provide a dummy, made from a waste piece, to be fastened at the bottom of the door

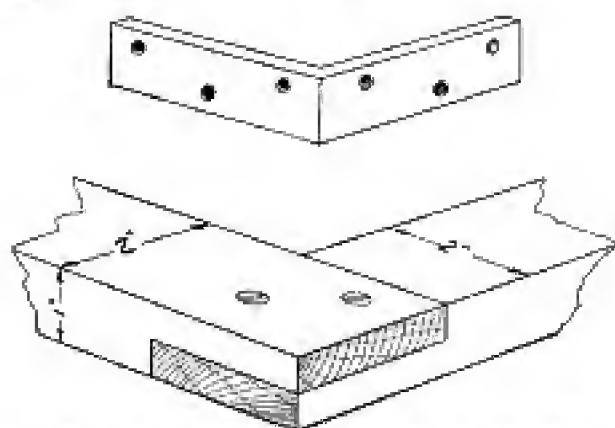


Cottage Built by Boys to Fill the Requirements of a Tuberculosis Society for a Demonstration in Their Crusade against the White Plague

studs until the sections are assembled, when it is removed. Use screws to fasten this piece in place. Nail five pieces of ship-lap, 5 ft. long, at the bottom of the section, and an 8-ft. piece at the top. Be careful to set the end studs in from the end of the board the exact thickness of the corresponding studs on the side section.

The back-end section is much more easily made. The top plate, as well as the floor plate, is cut the same

as on the other section. Place the intermediate stud on the center and nail on ship-lap, as in the other construction.

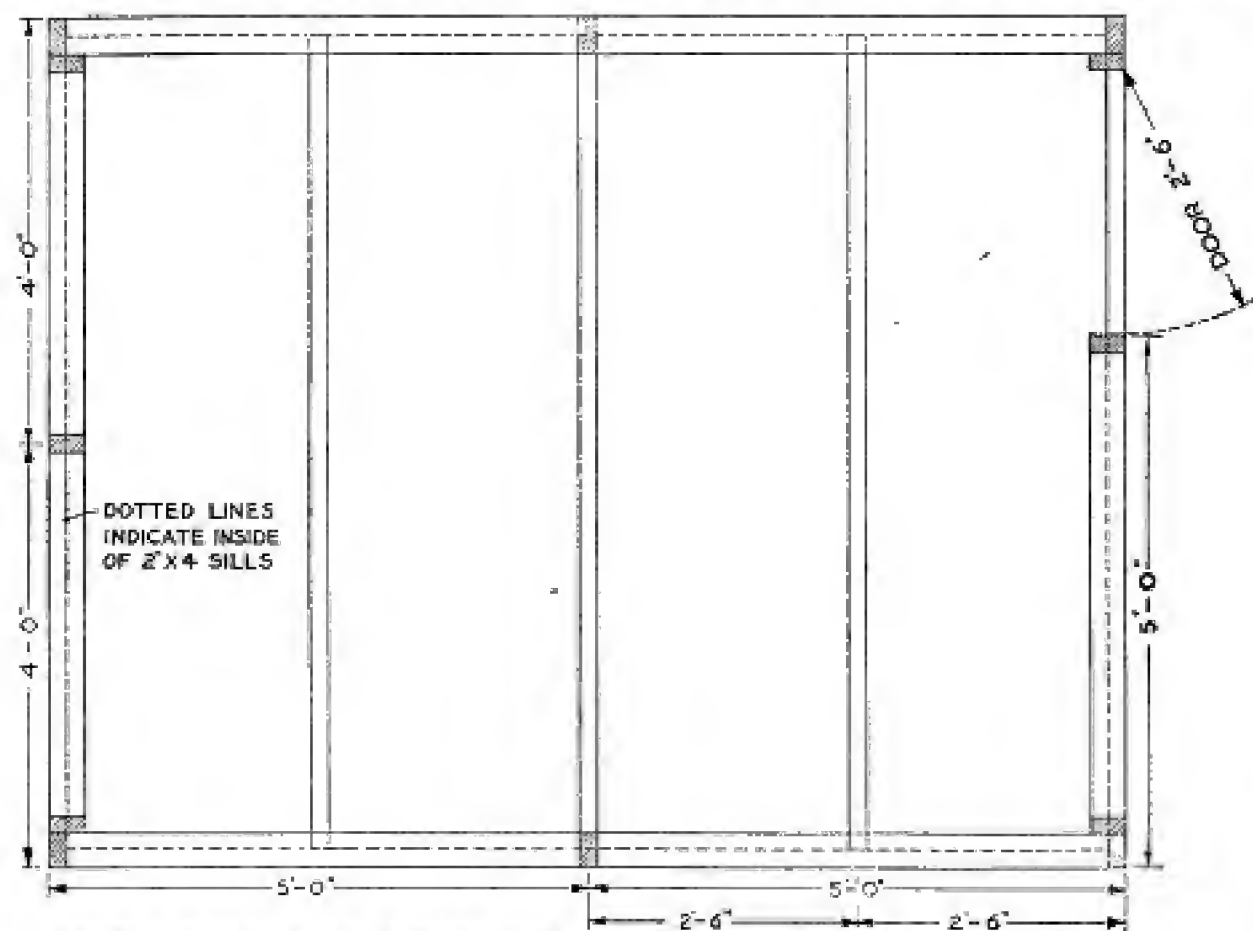


Lap-Joint Corner Construction with Angle-Plate Reinforcement for the Screens or Storm Screens

In making the roof sections, cut four rafters for an 18-in. pitch, or any other pitch desired. These are to be placed at the ends. Note the notch on the lower end of the rafter marked A in the illustration. Make allowance for the thickness of the rider marked C. This

piece can be made of 2 by 4-in. stock or any convenient material 1 in. thick. The rider must be nailed to the comb end of the rafters of one section, while a dummy, fastened to the under side of the rafters of the other section, will serve the purpose of holding them true until the roof is placed. Nail the sheathing on, closing the cracks between the boards as well as possible. Start at the comb end and bevel the first board for the comb joint. Make allowance for an 8-in. board at the lower end, so that a 4-in. overhang may be had. Cover these sections with the desired roofing. Place two screw holes at the lower end of each rafter to be used in holding the roof in place. Always use screws instead of nails, if the house is to be dismantled. Provide three rafter locks, marked B, and then the roof is ready for assembling.

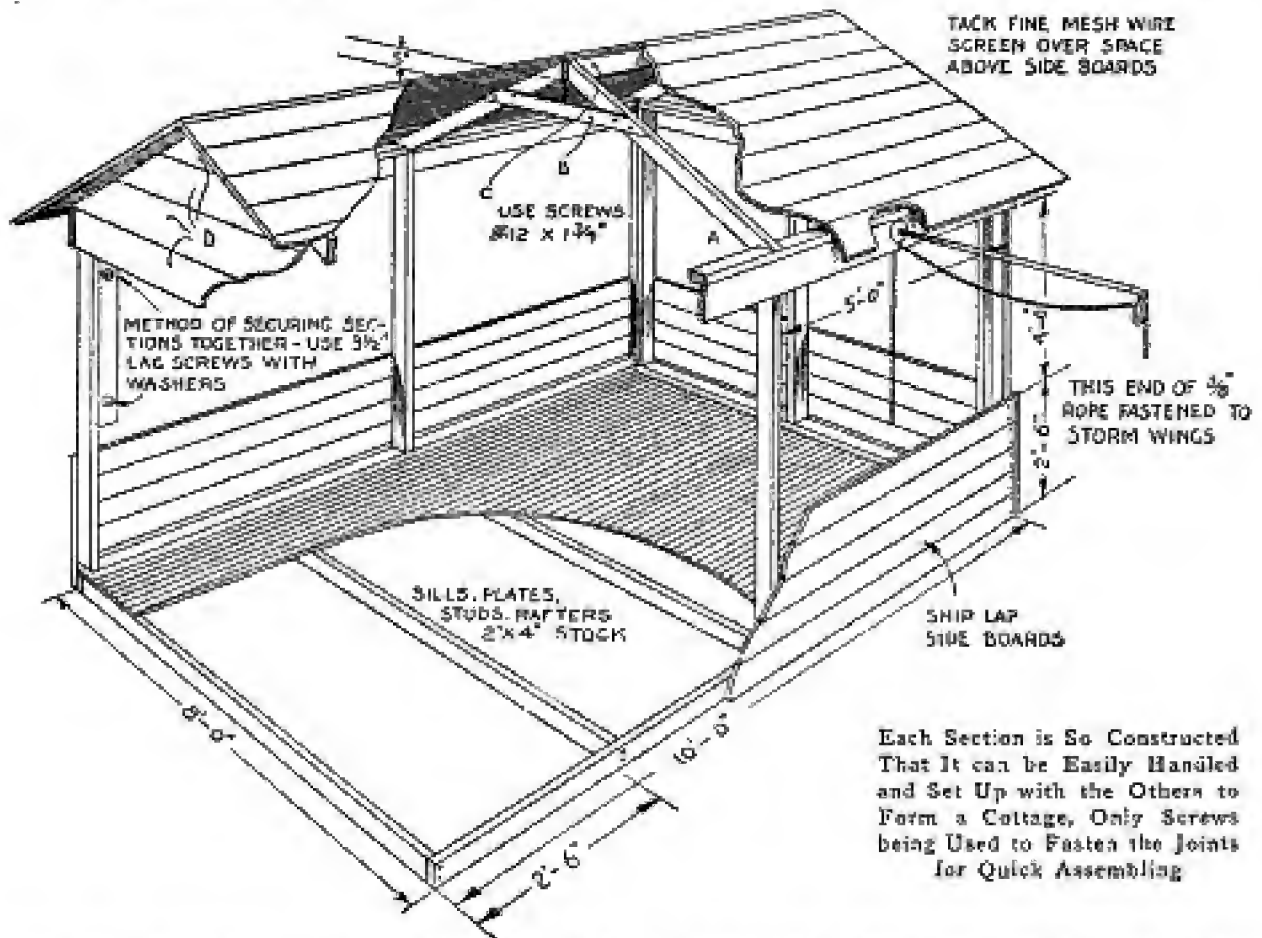
The three gable boards, cut from ship-lap, can be more easily made after the cottage is assembled. After they are fitted, each board must be fastened



The Floor Section Consists of Simple Frame Construction of Ordinary Material and Flooring Boards Fastened on the Frame to Make the Edges Flush with the Sides and Ends

with screws which will find a hold in the rafters. These boards are marked D. Be sure that all lag-screw holes

wall. Place screw eyes, to which the rope may be tied, at proper places on the inside of the wall boards. An ordi-



for the corner and floor moorings are bored before starting to assemble the parts.

The screens are made with the half-lap construction at the corners reinforced with angle plates. This construction is shown in the detail sketch. The screens, or storm wings, should be covered with a good grade of oilcloth or canvas. They are hung with an ordinary 3-in. wing hinge.

The adjusting device for these storm wings consists of a piece of 1-in. gas pipe, 4 ft. long, threaded on one end to receive a collar. Two flanges are used, one on each side of the board, above the wings and located centrally. A wood plug is driven into the outer end of the pipe, and a small pulley, suitable for a $\frac{3}{8}$ -in. rope, hung on it. Place a screw eye centrally into the lower edge of the wing and tie the end of a $\frac{3}{8}$ -in. rope to it. Run the other end of the rope through the pulley and a hole in the

nary screen door is hung in the door opening.

A house built in this manner was placed in the courthouse lawn as a permanent fixture. Among other things brought out in the construction was the fact that a cottage may be built by a boy at a cost less than \$50. Thus a stricken parent, brother, or sister may be provided, by the hands of a young mechanic, with the first means that may bring him or her back to health.

To Remove Putty from the Hands

Putty purchased from a dealer is usually in a soft and oily state, and the amateur glazier soon finds his hands, as well as the tools, plentifully smeared after the job is finished. Removing this from the hands with the putty knife or a stick is very tedious, but if a bunch of fine excelsior is used, the putty will be removed quickly and thoroughly.

INTERESTING NEW PATENTS

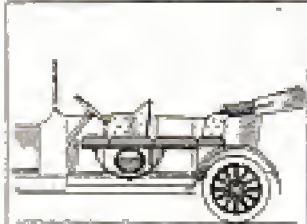


Fig. 1

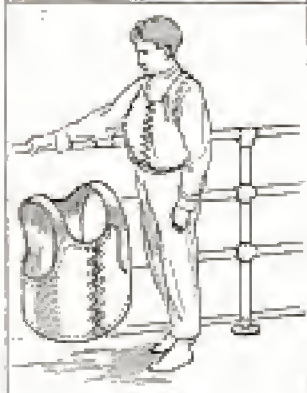


Fig. 2



Fig. 3

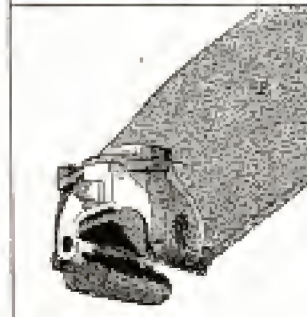


Fig. 4



Fig. 5



AUTOMOBILE SEATS THAT CAN BE MADE INTO LOUNGE (Fig. 1)—The front seat has a hinged back and a hinged front extension that ordinarily hangs vertically. These two sections are connected by a U-shaped rod that passes under the seat and is provided with a clamp with which the sections can be secured in any position. When the seats are to be converted into a lounge this clamp is released, and the back is swung down to a bearing on the front of the rear seat. Through the action of the rod this raises the front extension to a horizontal position.

TELEPHONE WITH SELF-COILING CORD (Fig. 2)—The free part of the cord is wound with light wire formed in spiral convolutions. The cord can be straightened out by a slight pull, but through the spring action of the wire it is formed into a compact coil on the base of the telephone when released.

COMBINATION CORSET AND LIFE PRESERVER (Fig. 3)—This garment is designed to be worn under the clothing as a corset and is therefore ready for use at any time as a life preserver. The body of the garment consists of two walls, which are waterproof and air-tight. The intervening space is inflated by means of a tube that hangs from the neck of the garment.

FOUNTAIN PEN WITH BLOTTERING CYLINDER (Fig. 4; Patent applied for by a Canadian)—The upper, or cylindrical, portion of the pen is covered with a cylinder of blotting paper. The end of the blotter is cup-shaped to fit over the end of the pen and is secured by a button that is screwed into the pen, the arrangement being such that the blotter is easily removed for renewal. Over the whole fits a shield for use when the pen is carried in the pocket.

IRONING-BOARD ATTACHMENT FOR KITCHEN TABLE (Fig. 5)—The ironing board slides in or out in a receptacle placed immediately under the table top, so that it is ordinarily concealed within the table but is easily drawn out for use. Hinged to the inner end of the board is a strut, and to the middle of this is pivoted a leg. When the board is drawn out the strut takes a diagonal position, and the leg is placed vertically, with the top inserted in a pocket on the under side of the board.

LIGHT DIFFUSER FOR AUTOMOBILE HEADLIGHT (Fig. 6)—The purpose of this invention is the elimination of the glare in automobile headlights. The device consists of a reflector and a glass distributor, the latter having ground or frosted facings with concentric corrugations. The direct rays from the lamp go through clear portions of the glass, while the reflected rays strike the frosted portions.

EMERGENCY COUPLING FOR RAILROAD CARS (Fig. 7)—With this device a broken coupling can be repaired on the road in a few minutes as long as the horn of the coupler remains unbroken. The device is attached by means of two nuts and is designed to give the coupler its original strength.

APPARATUS FOR STERILIZING LIQUIDS (Fig. 8; American patent to Frenchmen)—The liquid is first subjected to preliminary treatment by heating, and then, with the air excluded, is exposed to the action of ultraviolet rays. The temperature is kept below the degree at which there is danger of altering the character of the constituents of the liquid.

ELECTRIC FUSE PLUG (Fig. 9)—This fuse plug is equipped with 12 contact wires and can therefore be used 12 times simply by turning to a new contact in each case. The wires are easily renewed.

EXTENSION LADDER (Fig. 10)—The ladder is provided with two hinged legs, which, when drawn apart, make the ladder self-supporting. The extension portion slides vertically in guides placed at the junction of the two legs. The extension is held at any required height by friction surfaces carried on the ends of overlapping leaves that are pivoted to the legs.

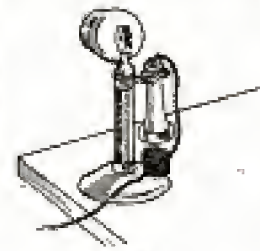


Fig. 2



Fig. 4

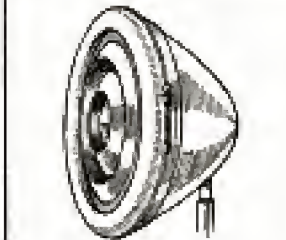


Fig. 6

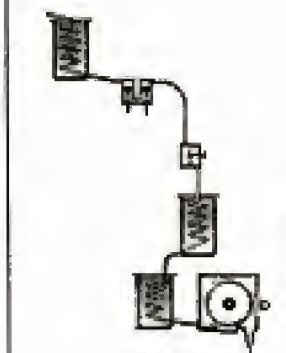


Fig. 8

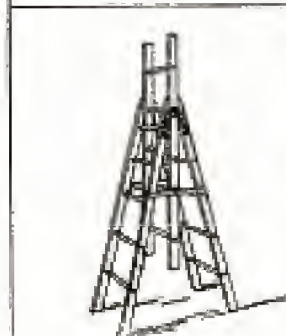


Fig. 10

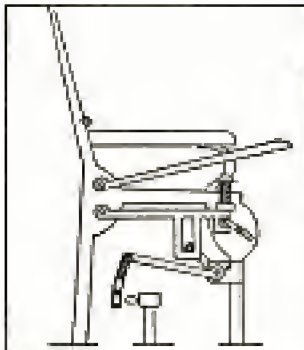


Fig. 11

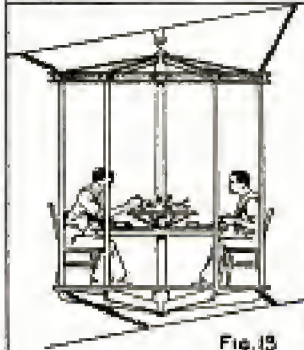


Fig. 13

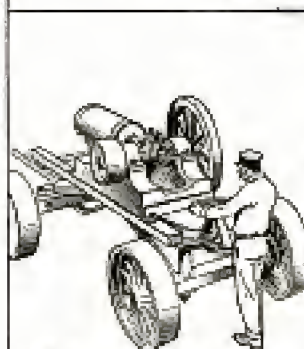


Fig. 15

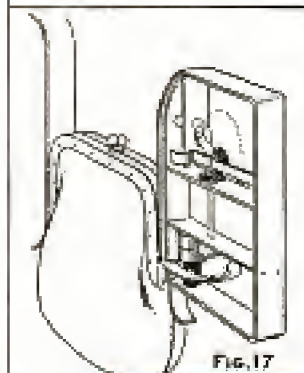


Fig. 17

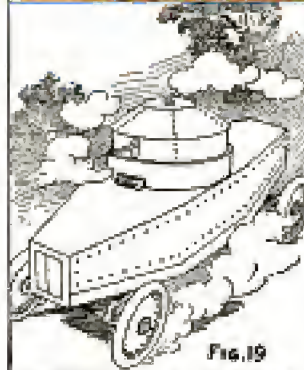


Fig. 19

SIGNAL LIGHTS FOR THEATER SEATS (Fig. 11)—With this apparatus a light shows at each end of a row of seats when any of the chairs in the row are unoccupied, the light being of one color when only single seats are vacant and of another color when there are two vacant seats together. A rocking shaft extends the full length of the row and on each end of this shaft is carried a shutter capable of three positions. In one position the light is masked, and in the other positions it shines through one of two colored-glass windows. The rocking shaft is operated by the hinged seats through arms equipped with pins that work in slotted bearings.

AUTOMATIC TRAIN STOP (Fig. 12)—This device is operated by a swinging arm that projects horizontally from a semaphore when the signal is set at danger. An air pipe connected with the air-brake system extends up the side of the locomotive and then outward horizontally. At the end of the horizontal section is a valve that is normally set in inoperative position. When the handle of this valve is struck by the arm on the semaphore the valve is opened and the brakes are set.

SELF-LEVELING TABLE FOR SHIP (Fig. 13; British patent to an American)—The table is mounted on a platform that is suspended by a universal joint from the deck above, the whole being free to swing and keep approximately level as the ship rolls or pitches. The amount of the swing is limited by coil springs connecting with the upper and lower decks.

AUTOMATIC GUN TRAP (Fig. 14)—When an animal steps on the trip plate it releases the platform and sets the mechanism in operation. A revolving firing pin then fires the cartridge that kills the animal, while a crank shaft raises the platform suddenly and ejects the dead body from the trap. With the completion of this operation the trap sets itself automatically for the next animal.

ENGINE ADJUSTABLY MOUNTED ON TRUCK (Fig. 15)—The engine bed is so mounted on the truck that the belt wheel can easily be aligned with the pulley of the driven machine. The front end of the bed swings on a vertical bolt in the front axle, while the sliding rear end is swung laterally by a ratchet and pinion.

GAS SOLDERING IRON AND BLOW-TORCH (Fig. 16)—This tool is made ready for use simply by connecting it by a flexible tube with any gas tip. The admission of air is regulated by a valve at the middle of the tool. The soldering tip is attached by means of a setscrew, and with this tip removed the tool is ready for use as a blowpipe.

ALARM FOR GUARDING AGAINST PICK-POCKETS (Fig. 17; British patent to an American)—This device is designed to sound an alarm when the purse or pocketbook is withdrawn from the pocket. When the purse is in position in the pocket it bears against a tongue spring. When the purse is removed the resulting movement of the spring actuates a mechanism that causes a set of hammers to strike a sounding plate.

BAG SUPPORT (Fig. 18)—This device consists simply of a canvas support mounted on a metal frame that can be suspended from the top of an open barrel, and is intended for convenience in filling bags. It may be either rigid or hinged so that it folds against the barrel.

ARMORED CAR WITH REVOLVING TURRET (Fig. 19)—The turret is made in two parts, the lower part being fixed to the body of the car, and the upper part, in which a rapid-fire gun is carried, being so mounted on a vertical axle that it can be revolved easily. A seat for the gunner is also mounted on the axle.

SPRAYING ATTACHMENT FOR BATH-TUBS (Fig. 20)—A pipe connected with the faucets extends around the inside of the tub, the side portions of the pipe being perforated for spraying. The spray is turned on and off by handles located at each side near the middle of the tub.



Fig. 12



Fig. 14

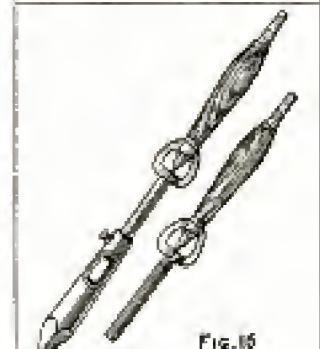


Fig. 16



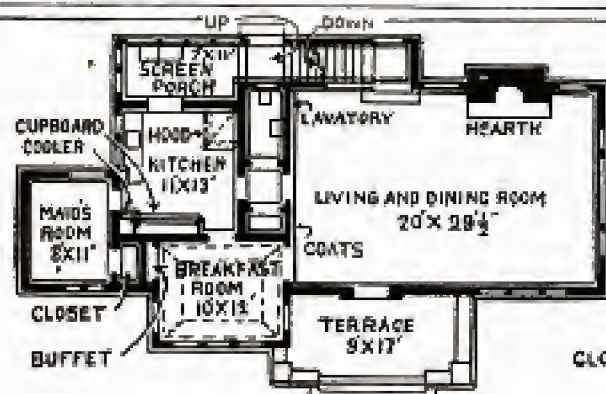
Fig. 18



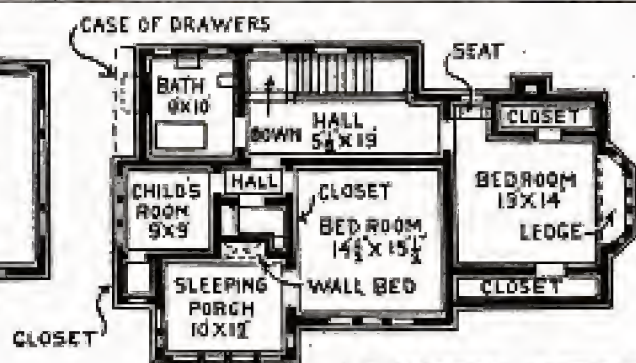
Fig. 20

AN ATTRACTIVE TWO-STORY RESIDENCE

Submitted by *C. A. Byers, 4013 Berenice Ave*
Los Angeles



First-Floor Plan



Second-Floor Plan

E. B. RUST, ARCHITECT, LOS ANGELES, CAL.

AN impressive feature about this house is the general effect of elegance and spaciousness that has been obtained, in view of the fact that the building complete, with a concreted basement 12 by 16 ft., cost only \$3,200. The construction is of a permanent character, the material used being hollow building tile. The exterior walls are faced with cream-colored cement stucco, the shingle roof is painted a light green, and the exterior woodwork is painted brown. The main entrance is at the side facing the driveway, and at this point there is a terrace which is floored with cement and is inclosed by a low wall built of blue-red brick. The woodwork of the living and dining room and of the stairway leading to the second floor is California redwood, waxed and polished, while that of the remainder of the building is mainly pine finished in white enamel. The floors of the living and dining room and of the breakfast room are of oak, and the remainder of the first story of pine. The second story is floored with maple.

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Lath and Plaster or Plaster
Board, as you wish
KNOTLESS Interior Base-board
KNOTLESS Inside Doors
KNOTLESS Outside Doors
KNOTLESS Window
Casings
KNOTLESS Door Casings
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Front and Back Steps
Nails in all sizes, guaranteed to be enough for house
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PORTLAND



MARSDEN

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Complete

\$399
Complete

\$498
Complete

\$595
Complete

\$683
Complete

\$797
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Complete

\$1289
Complete

\$1355
Complete



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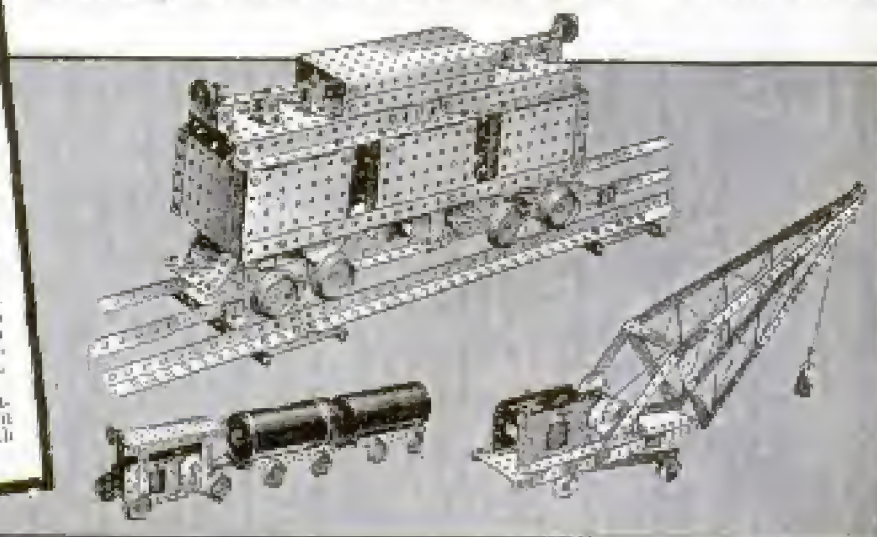
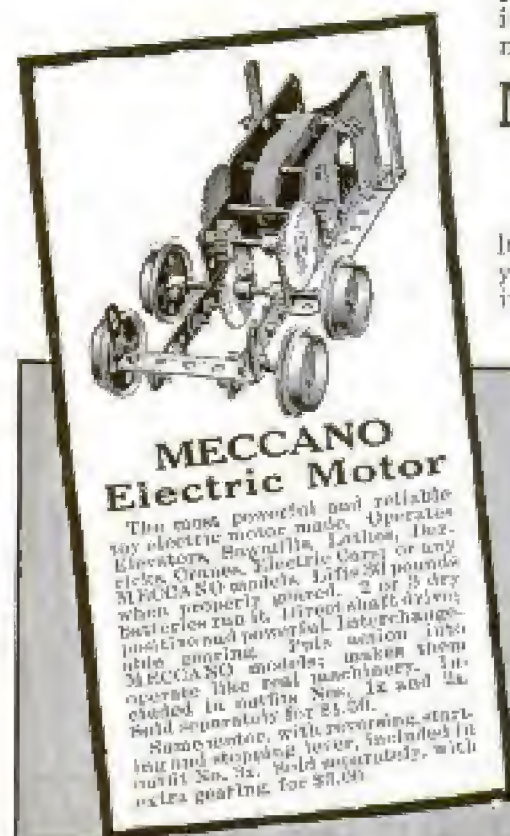


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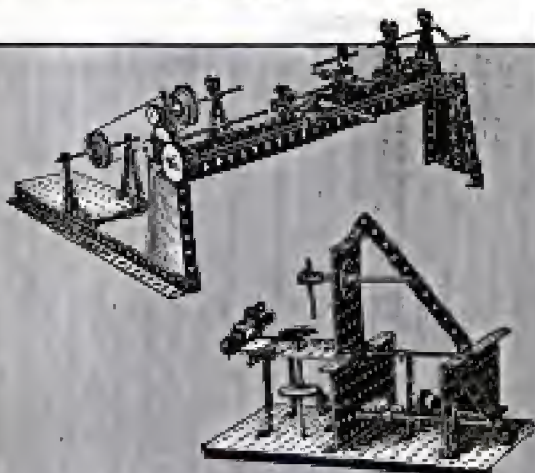
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What does your oil do?

Does it lubricate correctly—save power—protect your motor? Or does it just burn up?

IF you have checked up the mileage which different oils yield on your car, you have probably found that some oils are consumed far more rapidly than others.

Why?

If an oil too heavy in *body* is used, it will fail to reach all friction points.

Often an oil is too light in *body* for the motor's mechanical conditions. Excess oil then gets by the piston rings. Reaching the combustion chamber it burns.

When oil consumes rapidly, power-waste also occurs. The fuel charge escapes past the piston rings on the compression stroke. Gasoline consumption mounts up.

Even with oils of correct *body* a minute quantity of the oil works past the piston rings and is burned up.

But with oils of *incorrect body* this consumption becomes rapid.

It results naturally in sheer oil waste. But it results, too, in other more serious consequences.

One is excess carbon deposit.

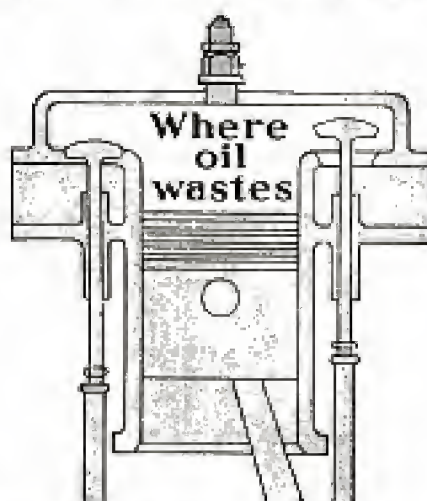
Of course too rich a gas mixture is a frequent cause of carbon trouble. But the experienced motorist knows—or should know—that an excess of lubricating oil in the combustion cham-

bers must result in unnecessary carbon trouble.

To minimize carbon, your lubricating oil must be of the correct *body* for the piston clearance of your motor.

Correct body is no subject for guess work.

A very large and rapidly growing class of motorists have found that their safest guide to correct *body* in lubricating oil is found in the lubricating Chart on the right. This Chart has for several years been the standard guide





to correct lubrication. It is annually brought up-to-date by a thorough engineering analysis of each year's models of every make of car by our corps of technical experts and represents our professional advice.

To first-time users the "wear" of Gargoyle Mobiloils is often astonishing. This is due in part to their unusual ability to "stand up" under the heat of service—and because they maintain a proper seal between pistons, piston rings and cylinder walls—i.e., have correct *body*.

In short, the oils stay where they belong. They are not burned up by working in excess quantities into the combustion chambers.



Mobil oils

A grade for each type of motor

The four grades of Cargyle Mobiloils for gasoline motor lubrication, purified to remove free carbon,

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Gargoyle Mobiloil "B"
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For Electric Vehicles use Gargyle Mobiloil "A" for motor and enclosed chains. For open chains and differential use Gargyle Mobiloil "C."

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Correct Automobile Lubrication

Explanation: In the Chart below, the letter opposite the car indicates the grade of Garguyle Mobiloids that should be used. For example, "A" means Garguyle Mobiloil "A," "Arc" means Garguyle Mobiloil "Arcite," etc. The recommendations cover all models of both pleasure and commercial vehicles unless otherwise noted.

| MODEL OR | 1912 | 1913 | 1914 | 1915 | 1916 |
|----------------|------|------|------|------|------|
| CARS | | | | | |
| Albion-Detroit | A | A | A | A | A |
| " 1912 | A | A | A | A | A |
| Alton | A | A | A | A | A |
| Alton (1912) | A | A | A | A | A |
| Alton (1913) | A | A | A | A | A |
| Alton (1914) | A | A | A | A | A |
| Alton (1915) | A | A | A | A | A |
| Alton (1916) | A | A | A | A | A |
| Alton (1917) | A | A | A | A | A |
| Alton (1918) | A | A | A | A | A |
| Alton (1919) | A | A | A | A | A |
| Alton (1920) | A | A | A | A | A |
| Alton (1921) | A | A | A | A | A |
| Alton (1922) | A | A | A | A | A |
| Alton (1923) | A | A | A | A | A |
| Alton (1924) | A | A | A | A | A |
| Alton (1925) | A | A | A | A | A |
| Alton (1926) | A | A | A | A | A |
| Alton (1927) | A | A | A | A | A |
| Alton (1928) | A | A | A | A | A |
| Alton (1929) | A | A | A | A | A |
| Alton (1930) | A | A | A | A | A |
| Alton (1931) | A | A | A | A | A |
| Alton (1932) | A | A | A | A | A |
| Alton (1933) | A | A | A | A | A |
| Alton (1934) | A | A | A | A | A |
| Alton (1935) | A | A | A | A | A |
| Alton (1936) | A | A | A | A | A |
| Alton (1937) | A | A | A | A | A |
| Alton (1938) | A | A | A | A | A |
| Alton (1939) | A | A | A | A | A |
| Alton (1940) | A | A | A | A | A |
| Alton (1941) | A | A | A | A | A |
| Alton (1942) | A | A | A | A | A |
| Alton (1943) | A | A | A | A | A |
| Alton (1944) | A | A | A | A | A |
| Alton (1945) | A | A | A | A | A |
| Alton (1946) | A | A | A | A | A |
| Alton (1947) | A | A | A | A | A |
| Alton (1948) | A | A | A | A | A |
| Alton (1949) | A | A | A | A | A |
| Alton (1950) | A | A | A | A | A |
| Alton (1951) | A | A | A | A | A |
| Alton (1952) | A | A | A | A | A |
| Alton (1953) | A | A | A | A | A |
| Alton (1954) | A | A | A | A | A |
| Alton (1955) | A | A | A | A | A |
| Alton (1956) | A | A | A | A | A |
| Alton (1957) | A | A | A | A | A |
| Alton (1958) | A | A | A | A | A |
| Alton (1959) | A | A | A | A | A |
| Alton (1960) | A | A | A | A | A |
| Alton (1961) | A | A | A | A | A |
| Alton (1962) | A | A | A | A | A |
| Alton (1963) | A | A | A | A | A |
| Alton (1964) | A | A | A | A | A |
| Alton (1965) | A | A | A | A | A |
| Alton (1966) | A | A | A | A | A |
| Alton (1967) | A | A | A | A | A |
| Alton (1968) | A | A | A | A | A |
| Alton (1969) | A | A | A | A | A |
| Alton (1970) | A | A | A | A | A |
| Alton (1971) | A | A | A | A | A |
| Alton (1972) | A | A | A | A | A |
| Alton (1973) | A | A | A | A | A |
| Alton (1974) | A | A | A | A | A |
| Alton (1975) | A | A | A | A | A |
| Alton (1976) | A | A | A | A | A |
| Alton (1977) | A | A | A | A | A |
| Alton (1978) | A | A | A | A | A |
| Alton (1979) | A | A | A | A | A |
| Alton (1980) | A | A | A | A | A |
| Alton (1981) | A | A | A | A | A |
| Alton (1982) | A | A | A | A | A |
| Alton (1983) | A | A | A | A | A |
| Alton (1984) | A | A | A | A | A |
| Alton (1985) | A | A | A | A | A |
| Alton (1986) | A | A | A | A | A |
| Alton (1987) | A | A | A | A | A |
| Alton (1988) | A | A | A | A | A |
| Alton (1989) | A | A | A | A | A |
| Alton (1990) | A | A | A | A | A |
| Alton (1991) | A | A | A | A | A |
| Alton (1992) | A | A | A | A | A |
| Alton (1993) | A | A | A | A | A |
| Alton (1994) | A | A | A | A | A |
| Alton (1995) | A | A | A | A | A |
| Alton (1996) | A | A | A | A | A |
| Alton (1997) | A | A | A | A | A |
| Alton (1998) | A | A | A | A | A |
| Alton (1999) | A | A | A | A | A |
| Alton (2000) | A | A | A | A | A |
| Alton (2001) | A | A | A | A | A |



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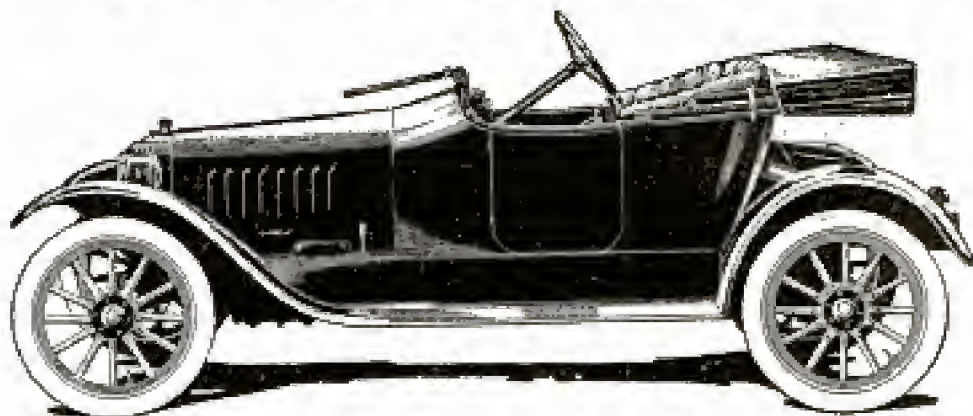
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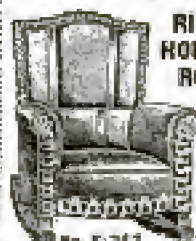
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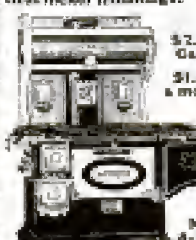
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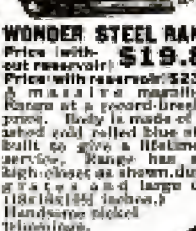
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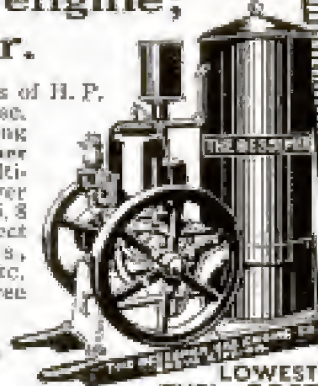
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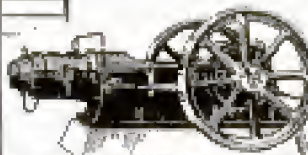
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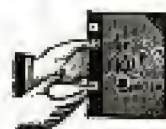
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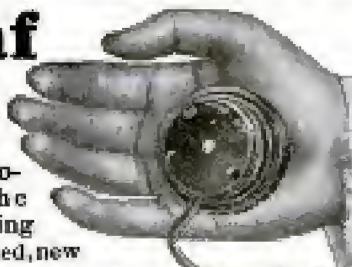


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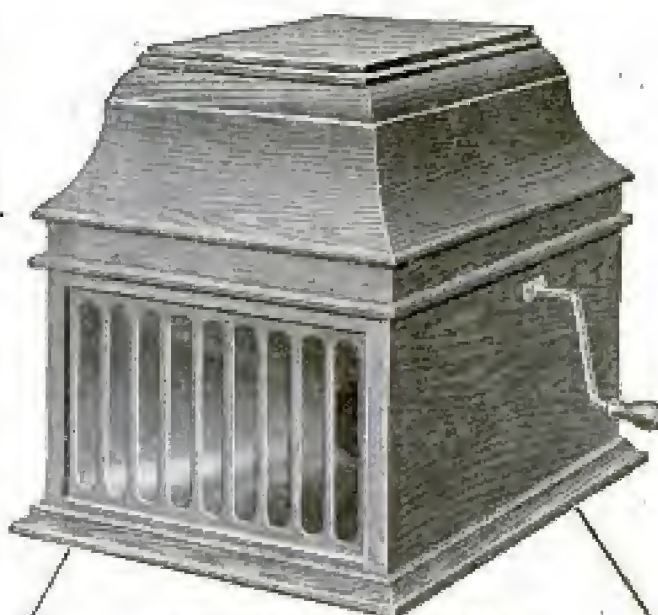
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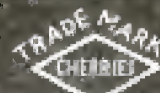


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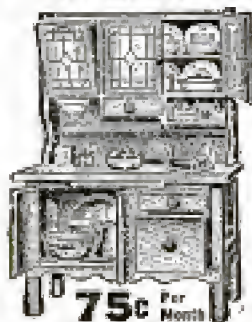


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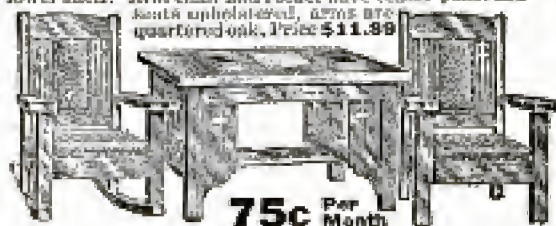


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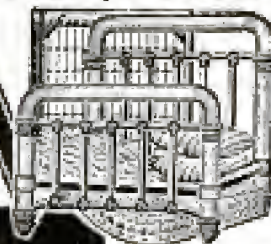
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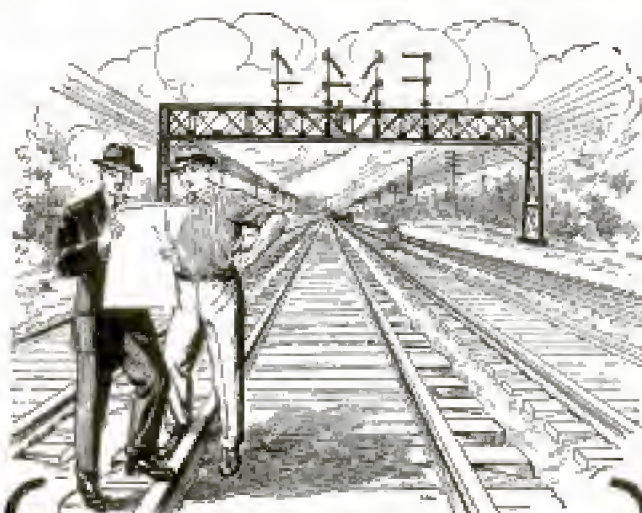
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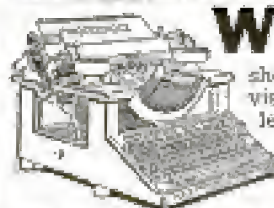
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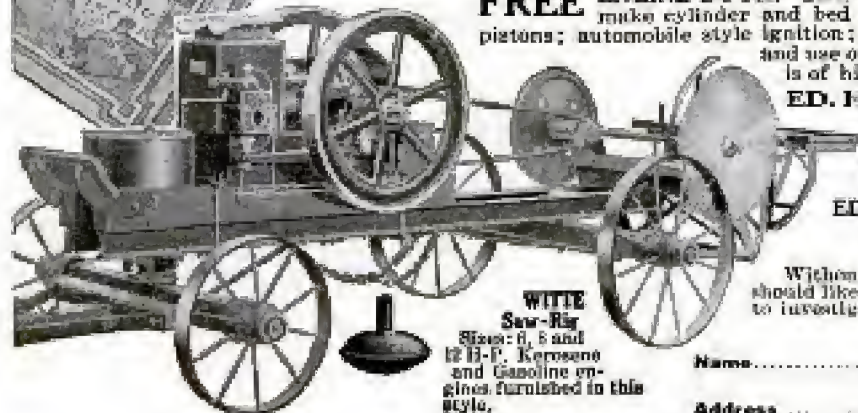
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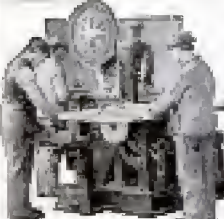
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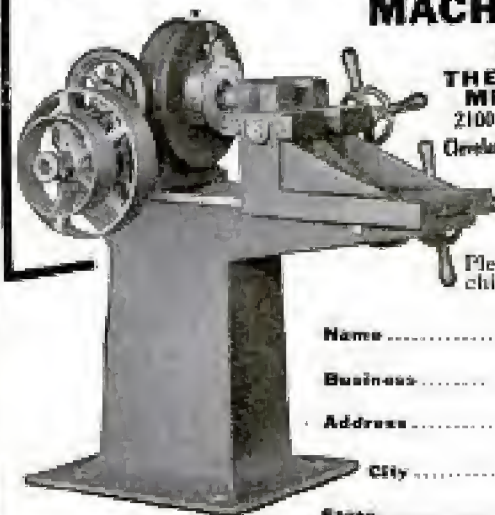
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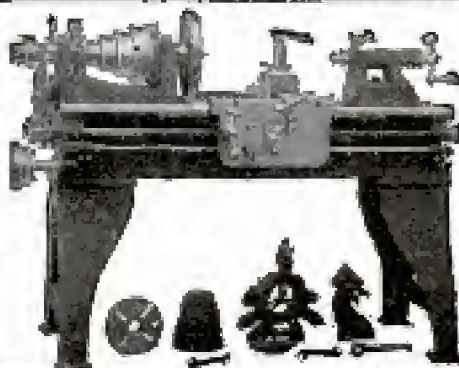
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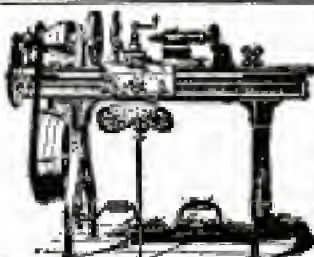
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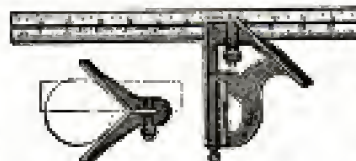


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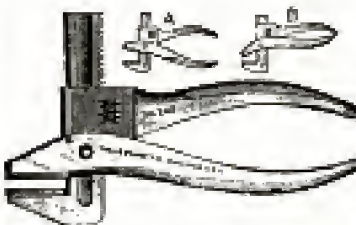
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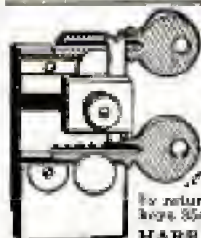
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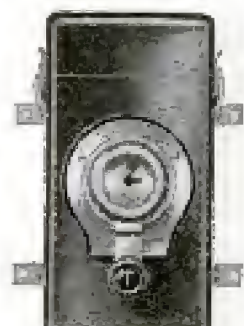
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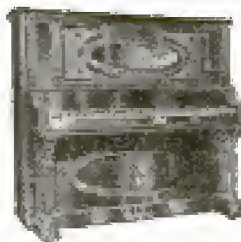
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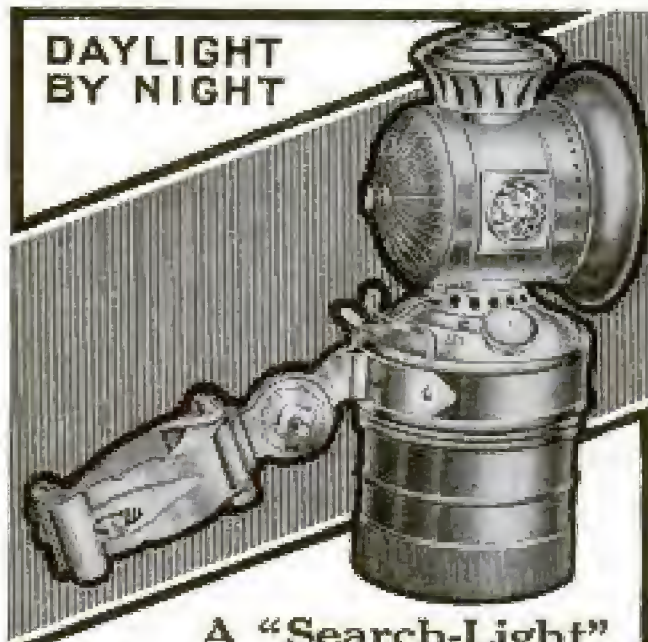
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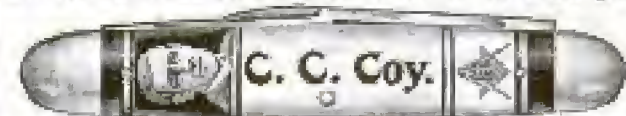
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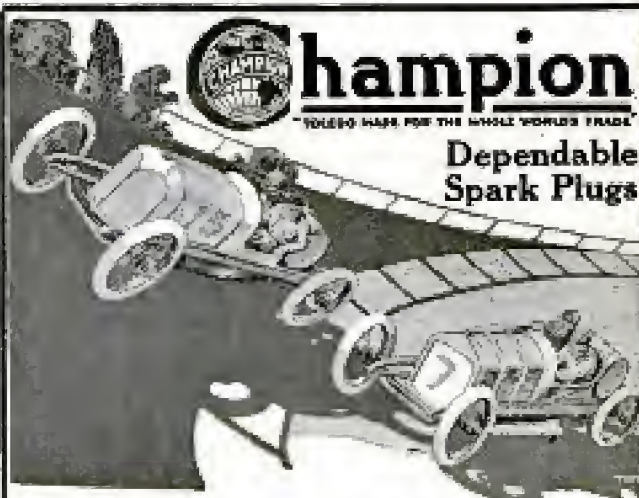
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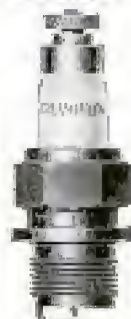
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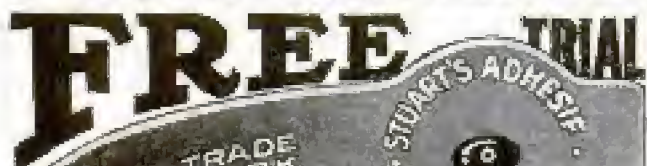
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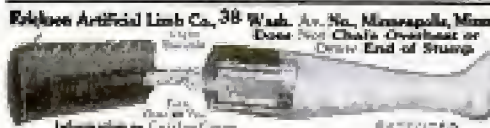
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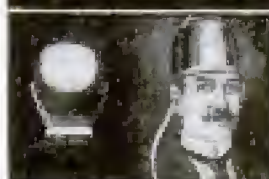


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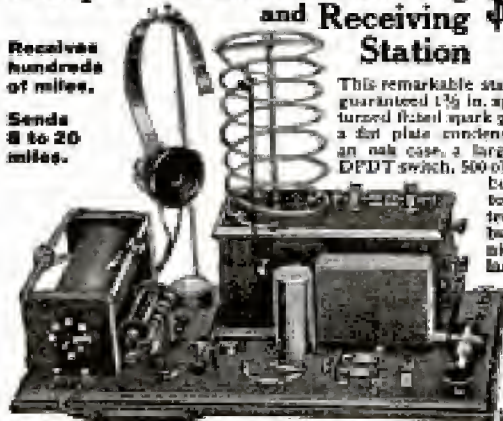
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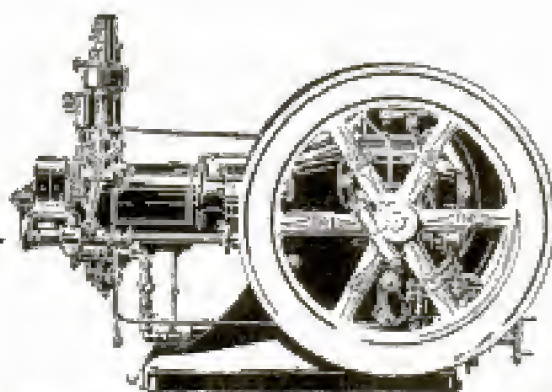
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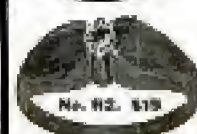
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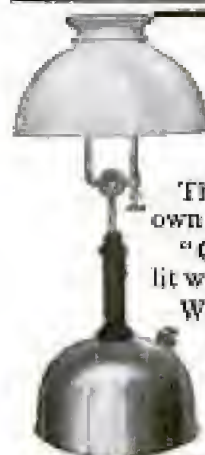
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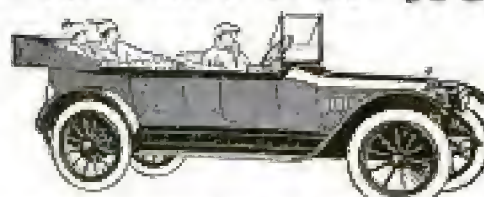
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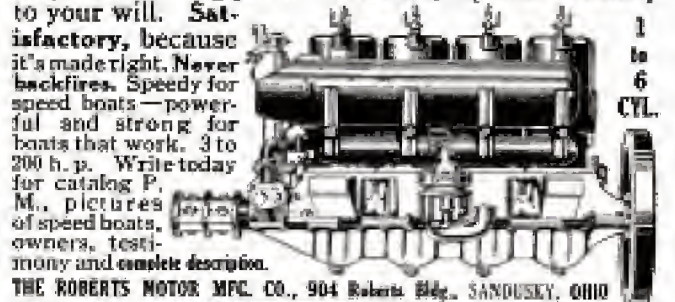
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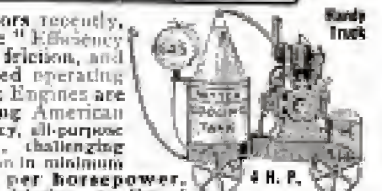
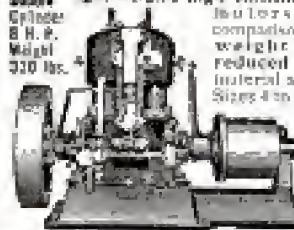
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Discussing light-weight motors recently, the Scientific American said: "Efficiency means light weight, reduced friction, and above everything else, lowered operating cost." Cushman Light-weight Engines are today recognized as the leading American light-weight, high efficiency, all-purpose motors, challenging comparison in minimum weight per horsepower, reduced friction, quality of material and workmanship and cost of operation.



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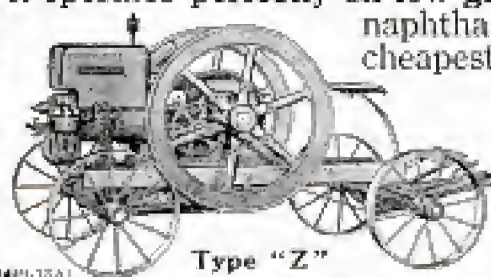
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common coal oil, and gives more than twice as much light as the best round wick open flame lamps. No odor, smoke or noise, simple, clean, no pressure, won't explode. Several million people already enjoying this powerful, white, steady light, nearest to sunlight. Guaranteed.

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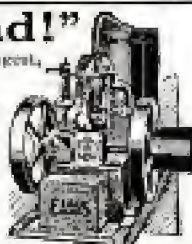
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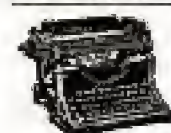
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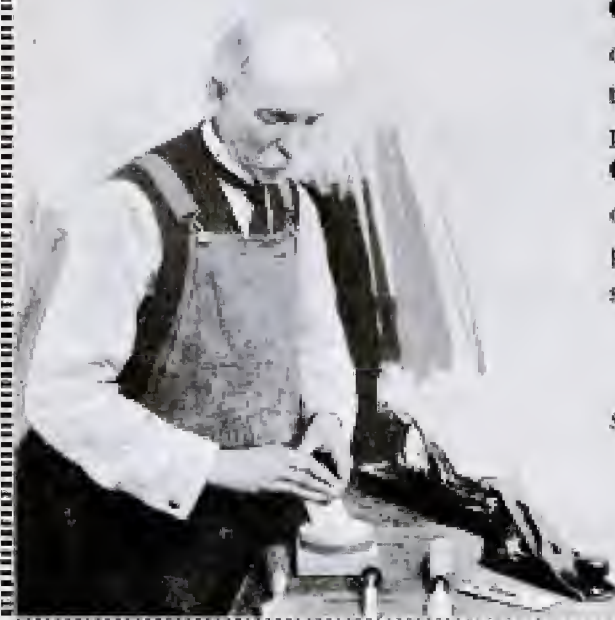
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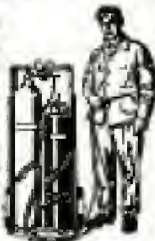
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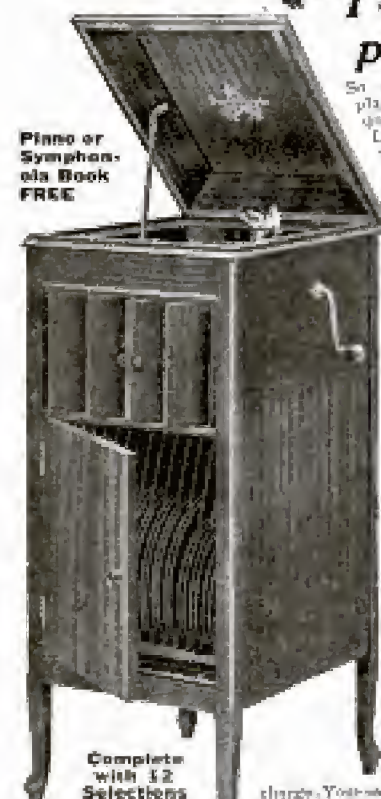
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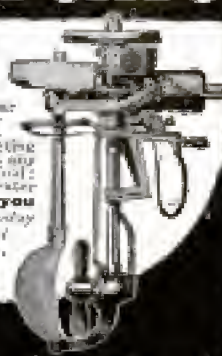
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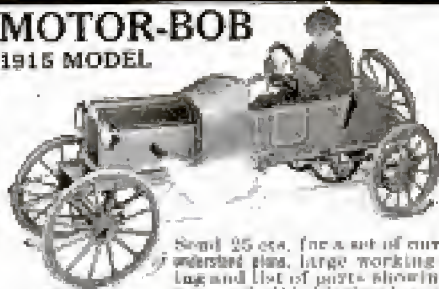
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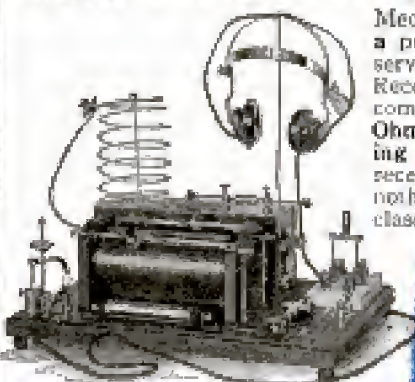
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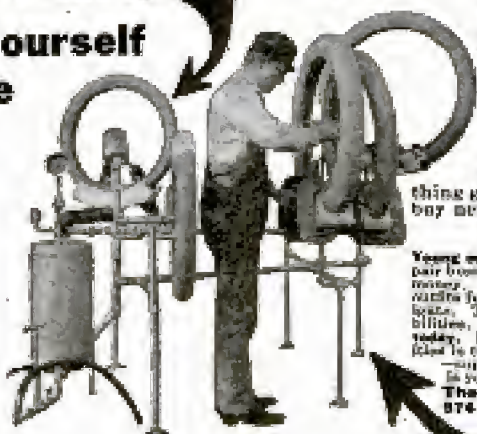
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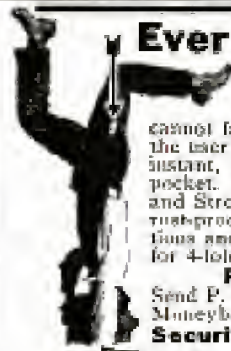
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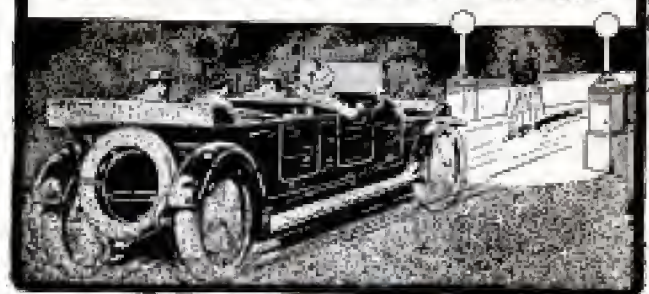
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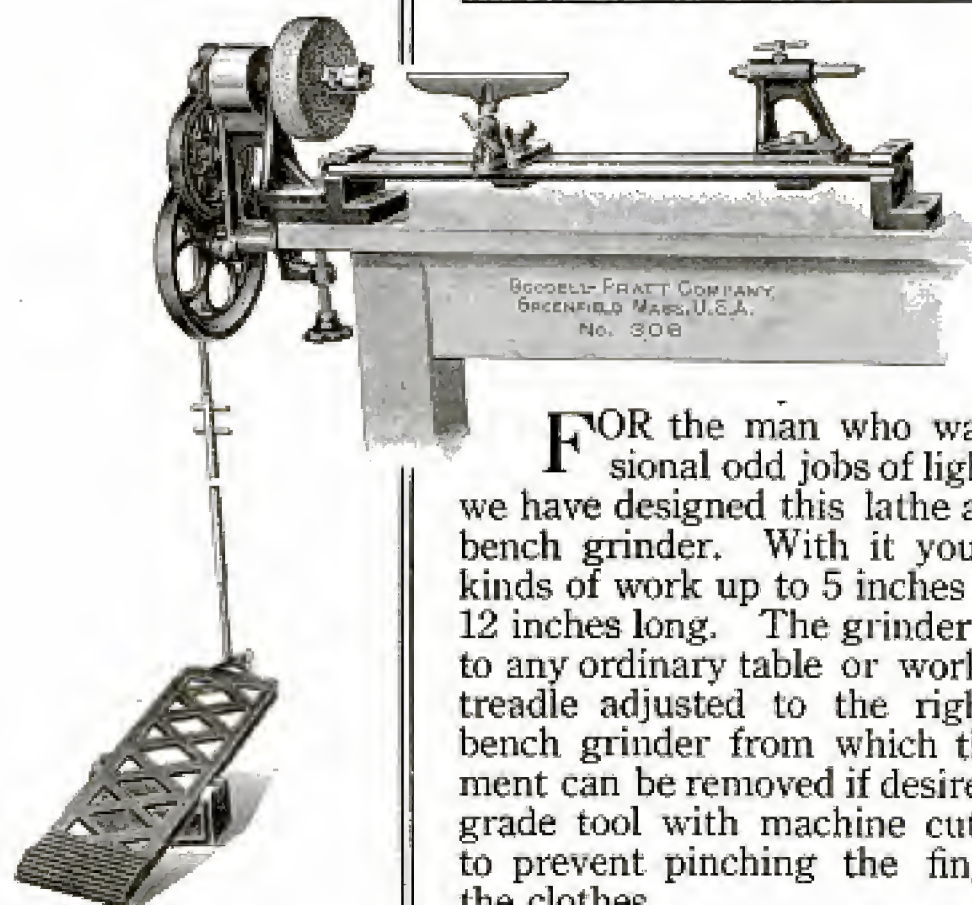
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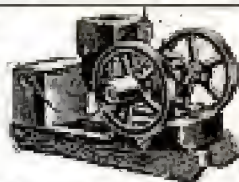
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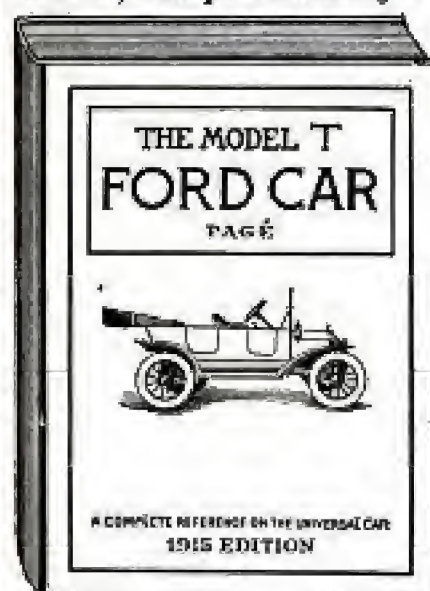
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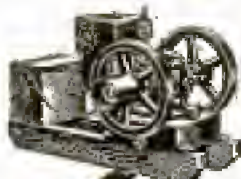
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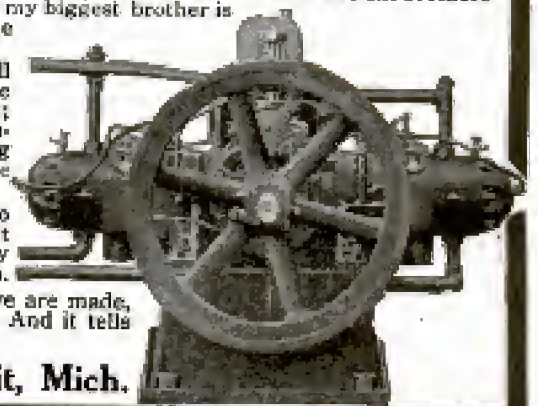
18 H. P. Some of us are vertical, and some horizontal; some have one cylinder and some two.

We do all sorts of work; we're no trouble to start; and we'll run 24 hours a day if you want us to. There are many attractive features in our family. We run fast or slow; we run very, very steady; we don't jump around; we run electric light plants, pumps, shop machinery, farm machinery, anything and everything. We are working now all over the United States and Canada, and in 32 foreign lands. We have to behave well to make good.

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The next time you are near one of the



Electric Lighting Stations look up the Meter Engineer at work. You probably will see a man sitting behind a mahogany desk directing the work of the scores of men under him. You will see a man who is in the \$3,000 class. A man who is looked up to by every one else in

the plant. **You can get a job like his.** You can get into the \$3,000 class. On this great offer you can get just the kind of training that you need in your own home—during your spare time.

More Men Needed

Over 500,000 new meters are going to be installed this year. Just think of the vast army of men that will be needed. We **must** find more Meter engineers.

Special Limited Offer

For a limited time we are making a great special offer in order to induce ambitious men to start the study of Meter Engineering right away. Send the free coupon for full particulars.

Send the Free Coupon

Fill out the coupon at top of this page. You do not obligate yourself in any way, shape or manner. It's just a request for the big new book on Meter Engineering. Everything is Free. Take this first step now.

Ft. Wayne Correspondence School, Dept. 1196, Ft. Wayne, Indiana

Please Mention Popular Mechanics

Hidden Factors of Service



Records kept like this are practically useless for the management of a business. Efficiency is impossible and funds for improvement cannot be obtained.



Records, statistics and accounts kept like this are available for a complete knowledge of the cost and efficiency of each department of the business.



Such methods result in a telephone line which can give only poor service.



The result of such records is a telephone line like this, which gives good service.



The subscriber knows the difference! He demands a well-informed, intelligent business management.



**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES**

One Policy

One System

Universal Service

Please Mention Popular Mechanics

A Year to Pay

Not One Cent For Three Months

Never before in the entire history of the gasoline engine business has there been an offer anything like this. And why? Simply because there has never before been produced an engine that could be sold at a remarkable bargain price, so marvelously perfect in every respect that its manufacturer has the confidence in it to say: "Take my engine. Don't send me a cent of your money until, from your own experience with it, you are absolutely sure that it is the engine you want. If it isn't, send it back at my expense. If it is, you may use it for 3 whole months before you make even the first payment and then pay the balance in 6, 9 and 12 months and I'll not charge you one cent of interest." No, you've never seen an offer like that before. Yet that is precisely the offer that Hartman makes on this world-famous Majestic Engine. Why this offer of

No Money In Advance

is possible. First, because the Majestic is such an amazing triumph in engine construction that we positively know it will stand up under the severest tests. Therefore, we have no hesitancy in sending it out without a cent in advance, without a deposit of any kind so that you, by testing it out on any and all kinds of work, may let it prove our claims for it right on your own place wholly at our risk. Second, because the tremendous financial strength of the great House of Hartman permits the extension of more liberal credit terms than have before been offered to the power users of this or any other country. Only the mammoth Hartman institution with its more than \$10,000,000 capital, immense buying power and enormous output could afford to make such an offer.



MAJESTIC STATIONARY ENGINE
Sizes 2, 3, 5, 7, 9 and 14 Horsepower
Iron sub-base mounting. Burns gasoline, gas, naphtha, kerosene, distillate. Backed up with strongest guarantee ever given a gasoline engine.

The Great Majestic Engines

GASOLINE, KEROSENE, NAPHTHA, GAS

The Majestic is the simplest, most durable, most powerful for its H.P. rating and most economical-to-operate gasoline engine ever made. Don't confuse it with old-style, over-heavy type of gasoline engines which are made after patterns designed years ago when gasoline was cheap. Those engines consume enormous amounts of fuel and are, therefore, expensive to operate. Other manufacturers have rushed to the opposite extreme and produced engines that are so light they literally jerk and tear themselves to pieces when running at high speed or under a heavy load.

The Majestic is the "happy medium"—neither too heavy nor too light. Has fewer number of parts—a marvel of simplicity. Perfectly balanced—just the right weight for the power it is designed to develop—no excessive friction. Big improvements in all vital parts—and the most wonderful automatic mixer ever put on a gasoline engine.

All Majestics are horizontal, 4-cycle type, open-jacket, hopper cooled. No over-heating of parts or sticking of valves. Very little water needed for cooling. Convenient, compact, easy to run.

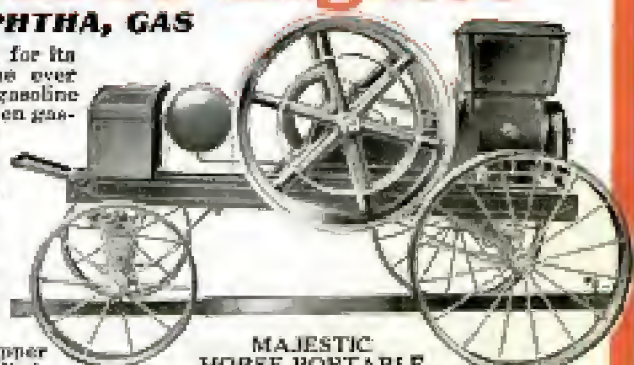
Your Credit Is Good

Remember, we send you any size or style Majestic you want without a cent in advance. Nothing to pay for 3 months. A full year to pay without interest. No bank deposit—no references asked—no mortgage—no embarrassing questions—no collectees—no red tape of any kind. You may pay all cash if you prefer but it is no cheaper. It costs you not one penny extra to take advantage of Hartman's full-year-to-pay without interest credit terms.

FREE Engine Book! Write at once for your free copy of this, the most valuable, most interesting book of engines ever published. Tells all about the wonderful Majestic, how made, and why it is the biggest engine value in America today. Tells how to pick out the size and style engine best suited for your needs and explains the Hartman selling plan whereby you may order any Majestic Engine you want without a cent in advance and take a full year to pay, without interest. ASK FOR SPECIAL ENGINE CATALOG No. 86-E.

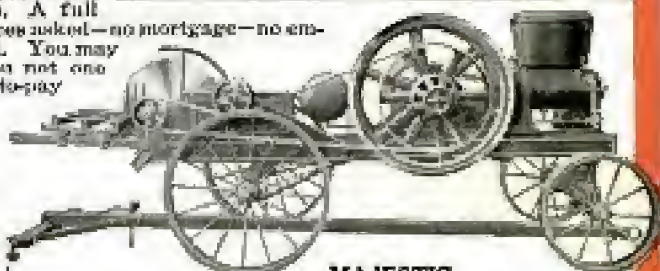
HARTMAN COMPANY

3945-47 La Salle Street, Chicago, Ill.



MAJESTIC HORSE PORTABLE

All-Steel Truck, widest-tread wheels, heavy hubs, staggered spokes. Feet made in swivel type so much that wheels, passing over obstructions, do not disturb level of engine. 5, 7, 9 and 14 H.P. mounted this style. Can be dismounted if you want stationary engine.



MAJESTIC PORTABLE WOOD SAW OUTFIT
With Friction Clutch Pulley

All Steel Truck. Table slides on wheels and is so constructed that it cannot sag or get out of alignment. Outfit shipped with saw and belt complete, ready for work. Saw Outfit can be removed, leaving you a Standard Portable Engine. 5, 7, 9, and 14 H.P. mounted this style.



This Magnificent Economy Iron On Free Trial

The Only Electric Flat Iron with a Steel Face—Heats Instantly

New sensation in "Hold-heat" electric household products. A steel-face iron with a 3-heat plug. Amazing saving in current, time and labor. The steel face **heats instantly** from heel to tip. No waiting. Cool top. Cold handle. Balanced to fit the hand. Runs smoothest. Irons better. Tip-up rest to save lifting. De luxe nickel finish. "Hold-heat" products are famous for fine quality. This is the finest we have produced. Full 6½ lb. weight. Lasts a lifetime. Sent on ten days' free trial prepaid on this limited introductory offer, only \$5.

Saves Money Every Washday

Saves two-thirds of the current on low heat. Saves one-half the current on medium heat. Pays for itself in current in less than a year. Throw away your clumsy, current-wasting old iron and save money. You owe it to yourself to try this steel face, easy running, economy iron to prove to yourself its superior advantages. Send now at our risk. Try it ten days free. See for yourself at our expense.

Three Heats

New, economy improvement in the Hold-heat Electric Iron—3 heats. You can change the heat instantly for different kinds of work. New style connection, easiest plug to handle. Never too hot. No scorching. Never too cold. No lost time. High heat for heavy, damp clothes, medium heat for ordinary ironing, low heat for laces, etc. Every woman will appreciate our delightful 3 heat improvement.

Try It Free

Use the Hold-heat Electric Iron ten days free to convince yourself of its many splendid, exclusive advantages. Use it 10 days free and you will never want to bother again with the wasteful, clumsy, cast-iron types or single heat irons. Send only \$5. If you are not delighted with the Hold-heat iron, return it at our expense and get your money back in full.

—Send This Coupon Today—

Cool Body Hot Face

The entire face heats instantly. No waiting. No delays. The fine polished steel face irons easier, quicker, smoother. Lasts forever. You will be astonished at the superior work it does and the time and labor and money it saves.

Guarantee

A positive guarantee is given with every "Hold-heat" Electric Iron to protect users against all defects in design, workmanship and material. The heating element is guaranteed for a period of two years against all kinds of use. Should it prove defective, we will replace it free. Every essential part of the "Hold-heat" Electric Iron is improved over ordinary irons for long life, as well as better service and greater economy. Take advantage of this special free trial money back offer.



Send To-day Fill out the special \$5 coupon, or copy it on a piece of paper. Send promptly and get the benefit of this special money back offer. Send only \$5. We will send to you prepaid the "Hold-heat" Electric Steel-face Iron with 8 feet of cord, easy plug and 3 heat connection, ready for use. After ten days' free trial, if you are not delighted, return the iron at our expense and have your money refunded in full. Send now, while this special free trial offer is open. Send to-day.

Brochlets on new, improved electrical home conveniences sent post-paid free to any address. Dealers and agents should write promptly for territory on our toaster-ovens, heating pad, sleeping blanket, cooling iron, drying comb, etc., etc.

National Electric Company
142 W. Austin Ave., Dept. 5241, Chicago, Ill.

The National Electric Company,
142 West Austin Ave., Dept. 5241, Chicago, Ill.

GENTLEMEN: In accordance with your special introductory free trial offer, I enclose herewith only \$5 for one "Hold-heat" Electric Iron. Instant heating face, de luxe nickel finish, equipped complete with 8 feet of cord, plug and 3 heat connection, all to be sent to me by Parcel Post free. I am to have the privilege of returning the iron in ten days and having price refunded in full to me.

NAME.....

ADDRESS.....